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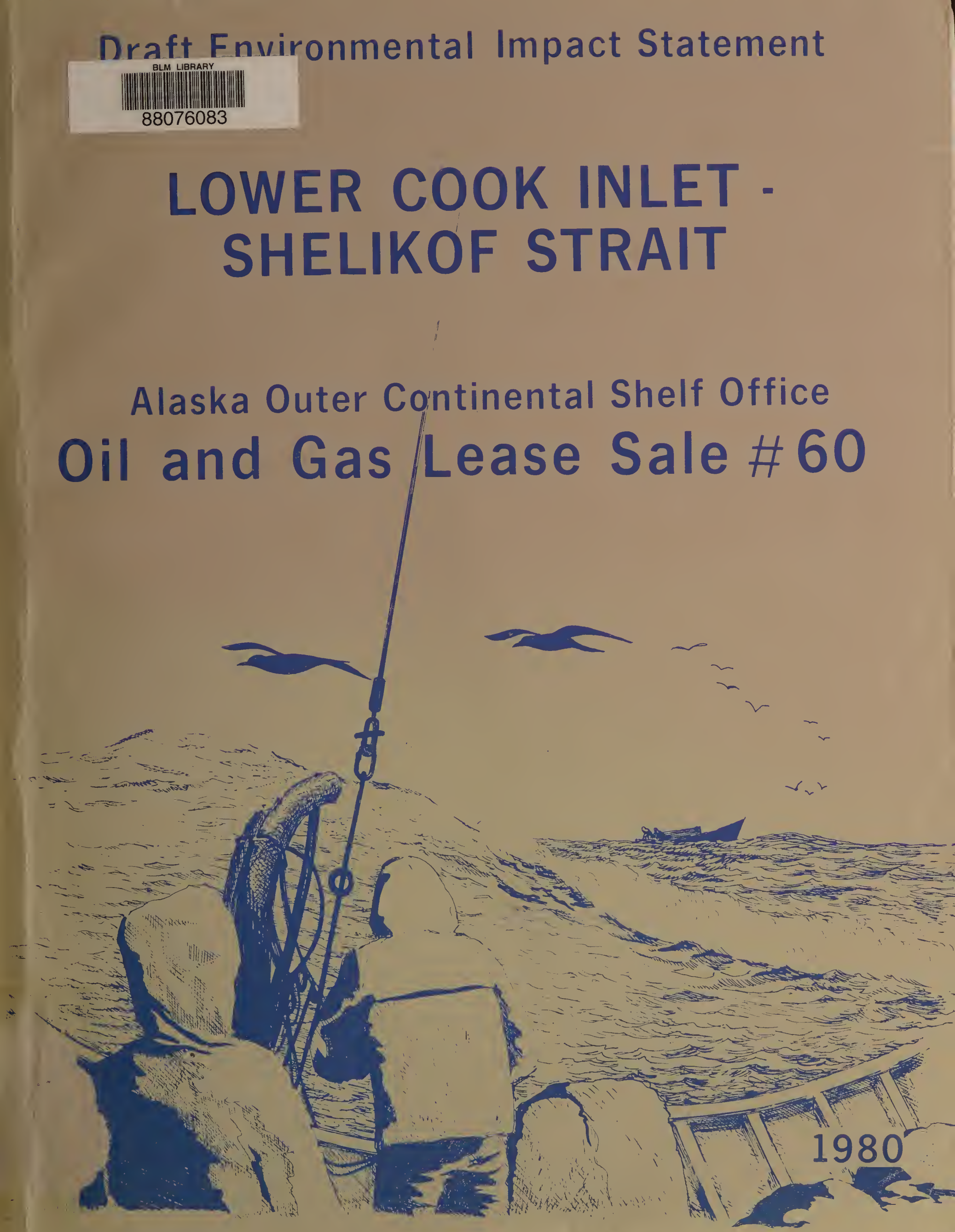
Draft Environmental Impact Statement

LOWER COOK INLET - SHELIKOF STRAIT

Alaska Outer Continental Shelf Office

Oil and Gas Lease Sale #60



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UNITED STATES
DEPARTMENT OF THE INTERIOR

DRAFT ENVIRONMENTAL IMPACT STATEMENT
PROPOSED OUTER CONTINENTAL SHELF
OIL AND GAS LEASE SALE
LOWER COOK INLET/SHELIKOF STRAIT

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DRAFT ENVIRONMENTAL IMPACT STATEMENT

Proposed Outer Continental Shelf
Oil and Gas Lease Sale
Lower Cook Inlet/Shelikof Strait

Summary Sheet

(X) Draft ( ) Final

U.S. Department of the Interior, Bureau of Land Management, Alaska OCS Office, P.O. Box 1159, Anchorage, Alaska 99510.

1. Type of Action: Proposed Oil and Gas Lease Sale, Lower Cook Inlet/ Shelikof Strait.

(X) Administrative ( ) Legislative

2. Description of the Action: A total of 349917 hectares of OCS lands are proposed for leasing action. The 153 blocks which may be leased are 5 to 37 kilometers (3 to 23 mi) offshore in water depths that range from 15 to 210 meters (49 to 689 ft). If implemented, this sale is tentatively scheduled to be held in September 1981.

3. Environmental Impacts: All blocks offered pose some degree of pollution risk to the environment. The risk potential is related to adverse effects on the environment and other resource uses which could result principally from accidental or chronic oilspills. There is a 5 percent probability that oil would be discovered in economically recoverable amounts. Socioeconomic effects from onshore development would have State, regional, and local implications.

Several block deletion alternatives and mitigating measures may be applied which would reduce the type, occurrence, and extent of adverse impacts associated with this proposal. Other measures, which are beyond the capability of this agency to apply, have been identified. Despite mitigating measures, some impacts are considered unavoidable. For instance, it is a possibility that oilspills would occur, some disturbance to fishery and wildlife values would occur, and some onshore development would occur in undeveloped areas.

For each significant ecological resource, the probability of an oilspill impacting them has been given, based on an oilspill risk model. The probability of an oilspill impacting significant ecological resources is considered in the impact analysis, based on an oilspill risk model. The probable impacts from the proposed action are as follows:

Oilspills have a 94 percent chance of impacting coastal habitats due to the expanse of relatively close shoreline surrounding the lease sale area. Although species would be variously affected, intertidal dwelling species, such as razor clams, could be destroyed outright or tainted for a period of up to 1 year. Marine and coastal birds and their habitats could be severely impacted by an oilspill event, especially in the Shelikof Strait area. Major impacts (25-75% mortality of a bird species population) from spill incidents could occur in locations such as the Barren Islands, Shelikof Strait, Kupreanof Strait, and Whale Passage. Some vulnerable bird species indicated in the impact discussion could take as long as 50 years to recover from a single 50 percent mortality event.

Groundfish, halibut, and other populations of demersal fish species may be reduced by the effects of oilspills to some unquantifiable amount during the life of the proposal in the Shelikof Strait area. This is especially true of halibut, a species widely distributed within the strait and whose larvae are subject to pollution risk for 6 months of the year. Salmon generally are the most vulnerable of the commercial species to pollution events due to their dependence on inshore areas. Among these, pink salmon populations are more susceptible to the effects of pollution. A pollution event could adversely affect, in unquantifiable terms, a year class or more of fry, as well as a year class or more of adults.

Pink salmon populations that use the streams on the west side of Kodiak Island, particularly between Uganik Bay and Malina Bay, and those that spawn in Kamishak Bay, would be more adversely affected from an oilspill event than elsewhere in the area. Salmon using western Kodiak streams could lose entire year classes, an effect that could last for 5 years or more.

The Uganik Bay to Malina Bay area of Kodiak Island and other sections of the Shelikof Strait pose high risk from a pollution event to crab, shrimp, and other shellfish. Impacts to such species are expected to be local, but for a long duration. The egg and larval forms of crab species are most susceptible to the effects of pollution events, although the cumulative effects of increased oil and gas production and transportation could directly affect adult crab populations to an unknown extent through contamination or reduction of food sources. This could also be true of shrimp and other shellfish, especially in the Shelikof Strait area. Shrimp populations would be at high risk on the west side of Kodiak Island and in the larval drift area off Kachemak Bay. Intertidal organisms, such as razor clams, could have productivity delayed for 10 years or more, depending on the damage to the habitat from oiling.

The proposed sale would have little or no affect on the Kodiak, Homer, Port Lions, Seldovia, and Kenai commercial fisheries as a whole. Fisheries impacts that may occur from chronic and catastrophic oilspill events are expected to be localized. Multiple-use conflicts between oil and gas activity and commercial fishing should be localized, of relatively short duration, and subject to remedial action.

Among marine mammals, sea otters and harbor seals are likely to sustain direct mortality from an oilspill event. With harbor seals, this is especially true of Kamishak Bay and the Shuyak-Afognak Island area, although mortality probably would be less than that of the sea otter. The sea otter could suffer most from an oilspill, with a major spill being capable of completely destroying the entire population of 2,000-4,000 animals that exist there today. The potential impact on sea lions is similar to harbor seals, with the Barren Islands providing the primary rookeries for sea lions. Sea lions could lose from 1 to 2 years of productivity depending on the time of the spill with regard to the life cycle of the sea lion.

There is a potential for adverse impacts on cetaceans (whales), especially if an onshore facility is located on the eastern shore of Kodiak Island, the effect of which would be disturbance to such species in and around Marmot Bay. The greatest amount of protection to whale habitat is expected to be needed around the Barren Islands, northern Afognak Island, and the east shore of Shelikof Strait.

The impacts from oil and gas production and transfer on primary and secondary species (and associated habitat) harvested for subsistence purposes within village subsistence-use areas cannot be quantified at this time, but are assessed at a high probability of risk from oilspill incidents. The proposal would subject the subsistence of the Kodiak Island villages along Shelikof Strait to a higher potential risk from an oilspill than for those villages elsewhere in the lease sale area. But, the cumulative effects of the proposal in relation to other oil and gas activities in the vicinity places the subsistence for the villages of English Bay and Port Graham at a risk approximating those of Kodiak Island villages. Port Lions and Ouzinkie would be additionally subject to the effects, undeterminable at this time, of chronic discharges and tankering incidents resulting from the oil terminal facility at Talnik Point. The same may be true of Homer near the Anchor Point environs terminal facility. The direct and indirect consequences at the village level of a major oilspill incident damaging locally used subsistence resources and/or habitats could include restricted local hunting or fishing, for a duration consistent with the damage incurred; social and cultural stress associated with the shortage of customary and traditional resources in the places they are usually found; increased cost in time and money to replace lost resources, assuming local transportation means were suitable for using an extended harvest range; and problems of food distribution and local storage should crisis-oriented replacement programs be initiated.

Sociocultural systems impacts could be expected in Kodiak, Port Lions, and Homer with differing effects. The potential for confrontation would exist in Kodiak basically between fisheries-oriented residents and newer oil-related residents, which could be intensified by a significant oilspill incident, causing increased social conflict and disorder. Impacts on sociocultural systems of Port Lions also would be significant, centering on the effects of competition for scarce community goods and services; but, these effects are expected to be interpreted primarily as benefits rather than costs to the community. In Homer, the potential for major oil and gas onshore facilities nearby would likely increase debate over the direction of community growth and character and add fuel to the controversy experienced in Homer earlier over lease sale CI.

A major population, employment, and economic stimulus impact on the local economy of Port Lions could be anticipated if an oil storage and tanker terminal facility were sited there. Being a small community with an expected slow (3%) annual rate of growth, the operations of an oil terminal facility and related functions could almost double the number of jobs available over the next two decades. The Homer area also would be expected to be impacted by an oil terminal site in the vicinity of Anchor Point, but to a lesser extent. A larger community, with access to the Anchorage labor pool to reduce disruptive secondary effects from local hiring, Homer is expected to be impacted less from OCS activities than from other sources of economic stimulus, which are expected to produce an employment growth rate of 5.2 percent annually during the next decade. This rate of growth in employment would increase to 6.5 percent with the lease sale. Elsewhere, the lease sale would be expected to produce only marginal increments in employment growth in the Kenai, Kodiak, and Anchorage areas and little or no economic stimulus to the villages on the Kenai Peninsula or Kodiak Island.

Significant impacts could be expected to all modes of transportation serving Port Lions under this alternative. A major expansion of the Port Lions air-

field, possibly including extension of the runway into Kizhuyak Bay, would be required for the facility to function as a forward air support base to OCS operations in Shelikof Strait. Air traffic volume would increase dramatically, especially during the development phase, as would ground traffic in and around Port Lions. An additional 21 kilometers (15 mi) of roadway would be required to connect the airfield with the oil storage and marine tanker terminal at Talnik Point, as well as to service the onshore pipeline system. The operations at Talnik Point would produce the primary marine transportation impacts, in the short run, through summer barge traffic of rock and construction materials to the site. This would temporarily interfere with fishing in Kizhuyak Bay. The impact of tanker traffic (approximately 5 vessels per month) to and from the Talnik Point facility could produce the long-term impact of closing nearby fishing grounds over the life of the facility. The navigational uncertainties of Whale Passage suggest it would be unlikely that a marine service and supply base would be constructed at Port Lions, thus reducing the potential impact there. However, a major cumulative effect in marine traffic congestion could result from the need to simultaneously construct the Talnik Point facility and the Port Lions small boat harbor. Transportation impacts from the lease sale elsewhere are expected to be minor to insignificant in the Anchorage area and minor to moderate, especially with respect to ground transportation, to the transportation systems of the Kenai Peninsula. Increased marine traffic, approximating 30-40 percent of all tanker traffic generated in the next decade, is the principal cumulative effect with regard to transportation within Cook Inlet.

4. Alternatives to the Proposed Action:

a. No Sale (alternative II).

b. Delay the Sale (alternative III).

c. Modify the Proposed Sale by deletion of 19 blocks in lower Cook Inlet and 66 blocks in Shelikof Strait (alternative IV).

d. Modify the Proposed Sale by deletion of 19 blocks in lower Cook Inlet and 81 blocks in Shelikof Strait (alternative V).

e. Modify the Proposed Sale by deletion of all blocks in lower Cook Inlet (86 blocks) (alternative VI).

5. Scoping Comments were requested from the following:

Federal Agencies
Department of Agriculture
Forest Service
Department of Commerce
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Office of Coastal Zone Management
Office of Ecological and Environmental Conservation
Department of Defense
Air Force
Department of the Army
Corps of Engineers
Naval Operations

Department of Energy
Federal Energy Regulatory Commission
Department of the Interior
    Bureau of Indian Affairs
    Bureau of Hand Management, State Director
    Bureau of Mines
    Fish and Wildlife Service
    Geological Survey
    Heritage Conservation and Recreation Service
    National Park Service
    Office of Aircraft Services
    Special Assistant to the Secretary
Department of Transportation
    Coast Guard
Department of the Treasury
Economic Regulatory Administration
Environmental Protection Agency

State of Alaska
The Honorable Jay S. Hammond, Governor
Department of Administration
Department of Commerce and Economic Development
Department of Community and Regional Affairs
Department of Environmental Conservation
Department of Fish and Game
Department of Health and Social Services
Department of Labor
Department of Law
Department of Natural Resources
Department of Public Works
Department of Revenue
Department of Transportation and Public Facilities
Office of Coastal Management
Office of the Governor
    Division of Policy Development and Planning,
    State-Federal Coordinator
University of Alaska

Local Government
Anchorage Municipality
    Honorable George Sullivan, Mayor
Homer Municipality
    Honorable Leo Rhode, City Mayor
    Larry Farnem, City Manager
Kenai Peninsula Borough
    Honorable Don Gilman, Mayor
Kodiak, Alaska
    Honorable Betty Wallin, Borough Mayor
    Stuart Denslow, former Borough Manager
    Gary Stevens, City Mayor
    Claire Harmoney, former City Manager

Kodiak Island Borough, OCS Advisory Council

Matanuska-Susitna Borough
Honorable Ron Larson, Mayor

Native Organizations
Kodiak Area Native Association
Kodiak Island Native Health Authority
Koniag, Inc.

Special Interest Groups
Alaska Conservation Society
Alaska Packers Association
Alaska Pacific Seafoods
Alaska Shrimp Trawlers Association
B & B Fisheries
Citizens Coalition of Coastal Communities
Columbia-Ward Fisheries
Cook Inlet Commercial Fishermen
East Point Seafood Company
The Homer News
Kachemak Bay Conservation Society
Kachemak Bay Defense Fund
Kenai Peninsula Fishermen's Cooperative Association
Kodiak Area Community Development Corporation, Inc.
Kodiak Historical Society
Kodiak King Crab, Inc.
League of Women Voters of Kodiak
M. V. All Alaskan
New England Fish Company
New Northern Processors, Inc.
North Pacific Fisheries Association, Inc.
North Pacific Processors
Pacific Pearl
Pan-Alaskan Fisheries
Radio Station KBBI
United Fisherman's Marketing Association
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I. PURPOSE FOR ACTION

The Federal Government is authorized by the OCS Lands Act, as amended (see sec. I.C.), to preserve, protect, and develop oil and gas resources in the OCS. These responsibilities must be carried out consistent with the need to make these resources available to meet the nation's energy needs as rapidly as possible, to balance orderly energy resource development with protection of the human, marine, and coastal environments, to ensure a fair and equitable return on these resources, and to preserve and maintain free enterprise competition.

This proposed action is part of the overall United States effort to reduce dependency on foreign sources of petroleum. Implementation of this proposal, assuming a commercial discovery, would contribute to the goals of ensuring uninterrupted energy supplies and reducing the balance of payments deficit resulting from petroleum imports.

A substantial imbalance exists between domestic oil and gas production, and consumption. Energy imports rose from 9 to 24 percent of the total energy supply over the 15-year period from 1962-1977, and despite increases in prices in recent years, energy imports almost doubled in the 5-year period from 1972 to 1977. Oil comprised 94 percent of the total energy imports in 1977.

The annual share of energy supplied by imports is forecasted to decline to 18 percent in 1990, compared to 24 percent in 1977. This reflects a net energy consumption growth rate of 1.8 percent per year during the period. This is significantly lower than the 2.6 percent annual growth rate experienced between 1962 and 1977, but shows a reversal in trend from the 0.5 percent annual growth rate in the 1972-1977 period.

Though other projections differ, including DOE's, under varying assumptions, it is clear that the United States will remain dependent on imported energy through this century. This dependency exposes the country to both threats of and actual interruption of imported energy supplies, having both national economy and security implications. Other energy forms, including solar, geothermal and nuclear fusion, will not significantly reduce dependence on foreign sources of energy before the end of this century. Therefore, the goal is to make OCS resources available to meet national energy needs consistent with the safeguards of the OCS Lands Act.

Reversal in the historical trend and/or prevention of its worsening depends heavily on Alaskan production maintenance or increase. The General Accounting Office has estimated that through the period of 1985-2000, Alaskan sources will be responsible for some 16 to 19 percent of all U.S. crude oil production. Similarly, the Alaskan contribution to U.S. natural gas production is expected to increase. By the year 2000, Alaska sources will comprise some 18.6 percent of all U.S. natural gas production.

A. Leasing Process: The Outer Continental Shelf Lands Act of 1953, as amended, charges the Secretary of the Interior with administering mineral exploration and development on the Outer Continental Shelf (OCS), as well as conserving natural resources of the shelf. The law requires that the Secretary of the Interior develop oil and gas, in an orderly and timely manner, to

meet the energy needs of the country, to protect the human, marine, and coastal environments, and to receive a fair and equitable return on the resources of the OCS. The Secretary delegated responsibility for the leasing of submerged Federal lands to the Bureau of Land Management (BLM) and the responsibility for the supervision of offshore operations after lease issuance to the U.S. Geological Survey (USGS). BLM works closely with USGS, particularly on technical matters. USGS also supervises and regulates exploration, development, and production activities after the leases are issued. The leasing process includes the following decisionmaking steps:

1. Sale Schedule: The Outer Continental Shelf Lands Act, as amended, requires the Secretary to develop a 5-year OCS oil and gas leasing program, to be revised at least once yearly. This program must consist of a schedule of proposed lease sales which the Secretary determines will best meet national energy needs for the 5-year period following its approval. The current schedule, approved in June 1980, covers the period from mid-1980, through mid-1985, and provides for 36 lease sales, including five reoffering sales. These reoffering sales will re-auction rejected-bid or no-bid tracts which were offered for sale in the previous calendar year.

2. Request for Resource Reports: Resource reports for a specific lease area are requested from numerous Federal and State agencies, generally from 2½ to 3 years prior to the scheduled lease sale date. These reports provide valuable geological, environmental, biological, oceanographic, navigational, recreational, archeological, and socioeconomic information on the leasing area to be offered, and are an important factor in determining the suitability for leasing and the possible need for mitigating measures for certain blocks within the leasing area.

3. Call for Nominations and Comments: The Call is a request for information and is published in the Federal Register. Responses are requested from oil companies and the public in general, concerning which blocks should be included in the lease sale.

4. Tentative Tract Selection: Using information received from the Call for Nominations and Comments, together with recommendations from USGS and Fish and Wildlife Service (FWS), State comments, and the Department of the Interior's own environmental, technological, and socioeconomic information, the Secretary selects a tentative list of blocks for further consideration for leasing in an environmental impact statement.

5. Scoping Meetings: Scoping meetings provide an opportunity for the OCS staff to meet with people in their own communities to surface important issues and alternatives to the proposed action. The OCS office works together with other Federal and State agencies, environmental groups, and concerned individuals to identify critical issues.

6. Preparation of Draft Environmental Impact Statement (DEIS): The issues and alternatives raised in the scoping meetings are further developed in the DEIS. Included in the DEIS are a description of the marine and onshore environments, a detailed analysis of possible adverse impacts on the environment (including cumulative impacts as a result of other projects in the area), proposed mitigating measures, any irreversible or irretrievable commitment of resources, the alternatives to the proposal, and the records of consultation and coordination with others in preparation of the statement.

7. Endangered Species Consultation: Pursuant to section 7 of the Endangered Species Act, consultation with other appropriate Federal agencies is required when there is reason to believe that a species which is on the list as endangered or threatened (or is proposed to be listed as such) may be affected by a proposed action.

8. Public Hearings: After the DEIS is released to the public, hearings are held to obtain comments on it. Oral and written comments are incorporated into the final EIS (FEIS), which is also made available to the public.

9. Secretarial Issue Document (SID): The SID is used by the Secretary to make his decision on whether to hold the sale and, if so, under what terms and conditions the sale should be held. (This document is confidential and is not available to the public until after the Secretary has made his decision and the final Notice of Sale has been published.)

10. Preliminary Notice of Sale: This notice is published in the Federal Register at least 90 days before the proposed sale date. It is also sent to the governors of any affected states, who then have 60 days to submit comments to the Secretary regarding the size, timing, or location of the proposed lease sale.

11. Decision and Notice of Sale: After all of the above steps have been taken, the Secretary makes his final decision on whether to hold the sale and, if so, on the terms to be included in the final Notice of Sale. The final notice, published in the Federal Register at least 30 days before the sale, may be quite different from the preliminary notice; tracts may be dropped, bidding systems may be altered, or stipulations may be added or amended.

12. Sale/Leases Issued: After the sale is held, the bids are reviewed by the Secretary and the Attorney General, and the Secretary has 60 days to accept or reject the bids.

B. Leasing History: The first Federal OCS lease sale in Alaska was held April 13, 1976, for the northern Gulf of Alaska (sale 39). Of the 186 blocks (408,134 hectares, or about 1 million acres) offered, 76 blocks (165,543 hectares, or 409,057 acres) were leased; the accepted high bids totalled $559,836,587.

Exploratory drilling on Federally leased tracts in the northern Gulf of Alaska began in September 1976, and resulted in 11 dry holes in the Yakataga shelf area. The last of the wells was abandoned in July 1978, and no further drilling activity has occurred nor is expected to occur. Of the 76 leases issued in the northern Gulf of Alaska, 69 leases have been relinquished as of June 1980. The remaining leases do not expire until May 1981.

The first Federal offshore oil and gas lease sale in Cook Inlet was held October 27, 1977. A total of 135 blocks covering 518,080 acres was offered on a cash bonus and variable royalty basis (46 blocks offered on a royalty basis and 89 blocks offered on a cash bonus basis. The total bonus received for the leased blocks was $398,471,313.36 of which 30 royalty blocks and 57 bonus blocks were leased, comprising 200,448 hectares (495,307 acres). At the present time, OCS leases in lower Cook Inlet are in the post-sale exploratory phase. As of July 1980, 10 exploratory wells and one COST well have been drilled in the area. No commercial finds have been announced.

Since 1959, the State of Alaska has held 19 competitive oil and gas lease sales in upper Cook Inlet, leasing about 1.9 million acres. Total bonus revenues received by the State for these leases were about $90 million. The last State sale in Cook Inlet was held in 1974. Production figures for 1978 for upper Cook Inlet reflect 45 million barrels of oil and 65.5 million cubic feet of gas produced.

A proposed sale in the eastern Gulf of Alaska (sale 55) is scheduled for October 1980. An FEIS on this sale was released in March 1980. A previous DEIS on the lease sale 46 area (Kodiak) was printed in April 1977. A change in the leasing schedule was announced shortly after publication, changing the sale date to December 1980, and a second DEIS was prepared in December 1979. Public hearings were conducted in Kodiak in March 1980. Based on the low resource potential and interest in exploration and on concerns expressed by the residents and officials of the Kodiak area, sale 46 was deleted. A sale in the Kodiak area (proposed sale 61) is now scheduled to be held in April 1983. A DEIS on this proposal will be available in March 1982. If both sales 60 and 61 are held as scheduled, there will be oil and gas exploratory activities on both sides of Kodiak Island.

OCS leasing in the Cook Inlet area has been the subject of controversy and litigation. In 1967, the Federal government and the State of Alaska began a jurisdictional lawsuit involving Cook Inlet, which arose when the State prepared to permit oil and gas exploration and development in portions of lower Cook Inlet. The State's claim to more than 300,000 acres of submerged land in lower Cook Inlet was based on the historic bay concept which provides for State ownership of the submerged land if the coastal nation traditionally asserts and maintains dominion over the lands with the acquiescence of foreign nations. However, the United States claimed that the lower portion of the inlet constituted high seas. This dispute was resolved by the U.S. Supreme Court in June 1975 (United States v. State of Alaska A-45-67, 422 U.S. 184), in which the court ruled that the State's proof was insufficient to establish Cook Inlet as an historic bay, and that the United States had paramount rights to the submerged land toward the lower or seaward portion of Cook Inlet.

The English Bay Village Corporation filed suit against the Cook Inlet sale CI in February 1977 (English Bay Village Corporation v. Secretary of Interior, Civil No. 77-174), alleging that the environmental impact statement did not meet NEPA requirements due to its failure to adequately discuss potential impacts to the village, and also its failure to discuss onshore support facilities siting and long-term impacts on lower Cook Inlet fisheries.

Interior Secretary Kleppe postponed the sale from January 1977 to October 1977. Following the sale, the English Bay suit was resumed. A settlement was entered in this case for amicable resolution of the suit and the case was dismissed in March 1978, subject to compliance by DOI with the settlement agreement.

As a result of the settlement agreement, USGS is required to prepare a developmental phase EIS for lower Cook Inlet leases should a discovery be made and to conduct a public hearing in English Bay. Also, Fish and Wildlife studies on toxicity of drilling muds are ongoing to determine adverse effects of exploratory drilling on fisheries in the area. The results of these studies are anticipated by December 1980.

C. Legal Mandates and Authority

OCS Lands Act: The Outer Continental Shelf Lands Act of 1953 (43 U.S.C. 1331 et seq.) as amended (P. L. 95-372; 92 Stat. 629), established Federal jurisdiction over submerged lands on the Outer Continental Shelf (OCS) seaward of State boundaries (generally 3 geographic miles seaward of the coastline). Under the OCS Lands Act, the Secretary of the Interior is responsible for the administration of mineral exploration and development on the OCS. The statute empowers the Secretary to grant leases to the highest qualified responsible bidder(s) on the basis of sealed competitive bids and to formulate such regulations as necessary to carry out the provisions of the act.

The act, as amended, provides guidelines for implementing an OCS oil and gas development program. From a national perspective, the basic purpose of the act is to expedite exploration and development of the OCS in order to achieve national economic and energy policy goals, assure national security, reduce dependence on foreign sources of oil, and maintain a favorable balance of payments in world trade. With respect to implementing a leasing program, this goal is constrained by the following considerations: 1) the receipt of fair and equitable return on oil and gas resources, 2) preservation and maintenance of competition, and 3) balancing orderly energy resource development with protection of the human, marine, and coastal environments. The information presented in this section will focus on the balancing of orderly resource development and environmental protection.

The Secretary of the Interior has designated BLM as the administrative agency responsible for the leasing of submerged Federal lands, and USGS for the supervision of offshore operations after lease issuance. The BLM regulations which govern the leasing of mineral deposits on the OCS and the granting of rights-of-way for pipelines on the OCS are contained in 43 Code of Federal Regulations (CFR), Part 3300. Regulations administered by USGS which govern the conduct of mineral operations are contained in 30 CFR Part 250, and are supplemented by OCS operating orders on an area-specific basis. An analysis by USGS of the Gulf of Alaska orders are included as appendix C.

Summary of OCS Law: The following discussion summarizes the provisions of the act and implementing regulations which mitigate some of the possible adverse impacts resulting from this proposal.

1. The Secretary is authorized to prescribe and amend rules and regulations at any time to provide for the prevention of waste and conservation of the natural resources of the Outer Continental Shelf and the protection of the correlative rights therein. As of the effective date, such new or amended regulations can be applied to all operations conducted under any lease.

2. The Secretary is authorized to suspend or temporarily prohibit an operation or activity pursuant to a lease or permit for environmental reasons.

3. The Secretary is authorized to cancel a lease or permit for environmental reasons.

4. The Secretary is authorized to issue regulations for unitization, pooling, and drilling agreements.

5. The Secretary is authorized to issue regulations for compliance with the national ambient air quality standards pursuant to the Clean Air Act to the extent that OCS authorized activities significantly affect the air quality of any State.

6. The Secretary may administratively cancel a nonproducing lease for the owner's failure to comply with any of the provisions of the act, the lease, or regulations under the act.

7. The Secretary may initiate a judicial proceeding to cancel a producing lease because of the owner's failure to comply with any of the provisions of the act, the lease, or regulations under the act.

8. Rights-of-way may be granted under such regulations and upon such conditions as may be prescribed by the Secretary, assuring maximum environmental protection by utilization of the best available and safest technologies.

9. Exploration must be undertaken pursuant to an approved exploration plan. No permit for drilling may be issued until all affected states with approved coastal zone management programs have concurred or have presumed to concur with the consistency determination provided by the lessee.

10. Geological explorations on unleased areas of the OCS shall be allowed only if such exploration will not be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure, or object of historical or archeological significance.

11. Governors of affected states may submit recommendations to the Secretary regarding the size, timing, or location of a proposed lease sale, or with respect to a proposed development and production plan.

12. The Secretary is authorized to enter into cooperative agreements with affected states for several purposes, including but not limited to, sharing of information, joint utilization of available expertise, the facilitating of permit procedures, joint planning and review, and the formation of joint surveillance and monitoring arrangements relevant to OCS operations, both onshore and offshore.

13. The Secretary shall conduct a study of any area or region included in any oil and gas lease sale in order to establish information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the OCS and the coastal areas which may be affected by oil and gas development in such area or region.

14. Subsequent to the leasing and developing of any area or region, the Secretary may conduct additional studies to establish environmental information and may monitor the human, marine, and coastal environments of such area or region.

15. The Secretary shall consider relevant environmental information in making decisions, in developing appropriate regulations and lease conditions, and in issuing operating orders.

16. In exercising their respective responsibilities, the Secretary and the Coast Guard shall require, on all new drilling and production operations and, wherever practicable, on existing operations, the use of the best available and safest technologies which the Secretary determines to be economically feasible, wherever failure of equipment would have a significant effect on safety, health, or the environment except where the Secretary determines that the incremental benefits are clearly insufficient to justify the incremental costs of utilizing such technologies.

17. The holder of a lease or permit shall maintain all operations within such lease area or within the area covered by such permit in compliance with regulations intended to protect persons, property, and the environment on the OCS.

18. The Secretary of the Interior, the Secretary of the Department in which the Coast Guard is operating, and the Secretary of the Army shall enforce safety and environmental regulations promulgated under the act. The Secretary and the Coast Guard shall promulgate regulations for onsite inspections of OCS facilities.

19. Any person having a valid legal interest which is or may be adversely affected may commence a civil action to compel compliance with the OCS Lands Act against any person, including the United States, for any alleged violation of any provision of the OCS Lands Act, or regulation promulgated thereunder, or terms of any permit or lease issued under the OCS Lands Act.

20. The Attorney General or a U.S. Attorney may institute a civil action for a temporary restraining order, injunction, or other appropriate remedy to enforce any provision of the OCS Lands Act, regulation or order issued under the act or any term of a lease, license, or permit issued under the act. Penalties available include:

a. A civil penalty of not more than $10,000 for each day of non-compliance.

b. A fine of not more than $100,000 or imprisonment for not more than 10 years, for any person who knowingly and willfully 1) violates any provision of the act, any term of a lease, license, or permit issued pursuant to the act, or any regulation or order issued under the authority of the act designed to protect health, safety, or the environment or conserve natural resources, 2) makes any false statement, representation, or certification in any application, record, report, or other document filed or required to be maintained under this act, 3) falsifies, tampers with, or renders inaccurate any monitoring device or method of record required to be maintained under this act, or 4) reveals any data or information required to be kept confidential by this act.

21. Prior to development and production of an oil and gas lease, the lessee shall submit a development and production plan to the Secretary for approval. The Secretary will determine whether or not the plan is a major Federal action requiring the preparation of an environmental impact statement. At least once, the Secretary shall declare the approval of a development and production plan in any area or region of the OCS, other than the Gulf of Mexico, to be a major Federal action.

22. The Secretary shall disapprove a development and production plan if:

a. the lessee fails to demonstrate he can comply with requirements of the OCS Lands Act or other applicable Federal law;

b. activities described do not receive a consistency concurrence by a state with an approved CZM plan and the Secretary of Commerce does not make the findings authorized by 307(c)(3)(B)(iii) of the Coastal Zone Management Act;

c. operations threaten national security or defense; or

d. because of exceptional geologic conditions, exceptional value in the marine or coastal environment, or other exceptional conditions exist, that 1) implementation of the plan would probably cause serious harm or damage to life, to property, to any mineral deposits, or to the marine, coastal, or human environments; 2) the threat of harm or damage will not disappear or decrease to an acceptable extent within a reasonable period of time; and 3) the advantages of disapproving a plan outweigh the advantages of development and production.

23. The Secretary shall not grant a license or permit for any activity in such a plan affecting any land or water use in the coastal zone of a state with an approved Coastal Zone Management plan, unless the state concurs or is presumed to concur with the consistency certification accompanying such plan.

24. The Secretary shall, from time to time, review each development and production plan. If the review indicates that the plan should be revised to meet the requirements of section 25 of the OCS Lands Act, the Secretary shall require such revision.

25. The Secretary shall provide affected states with information to assist them in planning for the onshore impacts of possible oil and gas development and production.

26. The Secretary of the Department of Transportation shall administer the Offshore Oil Spill Pollution Fund establishing compensation for injuries caused by oil discharges from an offshore facility or vessel.

27. The Secretary of the Department of Commerce shall administer the Fishermen's Contingency Fund which provides compensation for damage to fishermen's gear or vessels resulting from oil and gas exploration, development, and production.

Federal/State Coordination: The OCS Lands Act, as amended, provides a statutory foundation for the Department's policy of coordination of OCS activities with affected states and, to a more limited extent, local governments. At each step of the procedures that leads to lease issuance, participation from affected States and other interested parties is encouraged and sought. Set out below is a detailed discussion of coordination mechanisms required by the OCS Lands Act.

The Secretary of the Interior is required to invite and consider suggestions from the governors of any affected state during preparation of any proposed leasing program. Each such governor also receives a copy of the proposed leasing program for review and comment prior to its publication in the Federal Register. The Secretary is required to provide a written response to any request from a governor for modification of a proposed leasing program. State and local governments may comment directly on a proposed leasing program in its published form. The Secretary is obligated to establish procedures for review of proposed leasing plans and periodic consultation with state and local governments (section 18).

Within 60 days after notice of a proposed lease sale or receipt of a development and production plan, the governor of any affected state may make recommendations to the Secretary with regard to the size, timing, or location of the proposed lease sale or development and production plan. If the Secretary determines that any such recommendations provide for a reasonable balance between the well-being of the citizens of the affected state and the national interest, he must accept them. The Secretary must also respond to the governor in writing, giving his reasons for accepting, rejecting, or modifying the governor's recommendations. The Secretary may enter into cooperative agreements with affected states, for purposes consistent with the act and other applicable Federal law (section 19).

When soliciting nominations for the leasing of lands within 3 miles of the seaward boundary of any coastal state, additional information is to be provided to the governor of those states. The governor must be informed of the identity of and schedule for the area proposed for leasing; the geographical, geological, and ecological characteristics of the area within 3 miles of the seaward boundary; an estimate of oil and gas reserves in these areas; and any field, trap, or geologic structure in these areas. After the close of the call period, the governor is informed of any area which merits further consideration for leasing (section 8(g)); he is further consulted on oil and gas pools underlying the Federal and state areas and on the opportunity to enter an agreement concerning the disposition of revenues which may be generated by a Federal lease in such area.

Under section 25 of the act, the Secretary must submit copies of development and production plans to the governor of any affected state for review. The state then has 60 days to provide comments and recommendations to the Secretary. Section 11 of the act and the regulations contained in 30 CFR 250.34 also require that any exploration plans submitted to the Secretary must be approved or disapproved within 30 days. Written comments from the governor of an affected state will be considered prior to approval action if they are timely.

Under section 26 of the act, the Secretary must make available to affected States a summary of data to aid them in anticipating possible onshore effects of OCS development and production. The summary includes estimates of oil and gas reserves in areas leased or to be leased, estimated size and timing of development, pipeline location, and the general location and nature of onshore facilities.

The act also requires preparation and transmittal to each affected state of an index of all relevant actual or proposed programs, plans, reports, environmental impact statements, tract nominations, and other lease sale information. On request, the Secretary must send copies to the affected state.

Establishment of Compensatory Funds:

1. Title III of the OCS Lands Act, as amended, establishes in the U.S. Treasury an Offshore Oil Pollution Compensation Fund, to be administered by the Secretary of the Department of Transportation and the Secretary of the Treasury. This fund provides compensation for cleanup costs and pollution damages resulting from an oilspill discharged in connection with OCS activities. Compensation from this fund may be sought by any person suffering any direct or actual injury caused by the discharge of oil from an offshore facility or vessel. The fund is maintained by a fee of 3 cents per barrel of oil levied upon owners of oil produced on the OCS. The law establishes procedures to modify the fees to maintain the fund at a level between $100 and $200 million. The Department of Transportation has published final regulations implementing the Offshore Oil Pollution Compensation Fund effective March 17, 1979 (44 FR 16860, March 19, 1979), included as appendix F.

Claims for economic loss arising out of oil pollution may be asserted for damage to or destruction of property or natural resources, loss of income resulting from damage to or destruction of property or natural resources, and loss of use of property or natural resources. Any U.S. citizen who owns or leases property or uses natural resources involved in an oil pollution incident may present a claim to the fund. This includes subsistence users of natural resources, except that compensation is not allowed to the extent that reasonable alternatives to the affected activities were available but not utilized. In order to claim compensation for loss of income, a person must show he or she derives at least 25 percent of annual earnings from activities which use the property or natural resources. Compensation is limited to the reduction or loss of earnings or profits suffered, but is not allowed for lost employment or business when appropriate substitute employment was available but not undertaken. A claim may be made by the Federal government for loss of natural resources over which it exercises sovereign rights or exclusive management authority, or by the State of Alaska for natural resources owned or managed by the State. Compensation is allowed for the cost to restore, rehabilitate, or acquire the equivalent of the natural resources and any additional economic losses actually suffered. Federal, state, and local governments may also assert claims for tax revenues lost due to property damages. A member of a group of U.S. citizens who would be more adequately represented as a class in asserting their claims may maintain a class action to recover damages on behalf of that group.

Owners, operators, and guarantors of offshore facilities and vessels are held strictly liable for all loss attributable to oil pollution from their facilities. Except in cases of gross negligence, willful misconduct, or violation

of safety regulations, liability is limited in the case of vessels to the greater of $250,000 or $300 per gross ton, and for offshore facilities, to the total cleanup and removal costs plus $35 million in damages for each incident. Evidence of financial responsibility for each offshore facility or vessel adequate to satisfy the maximum liability must be established and maintained with the Federal government. Compensation from the fund is available without limitations to the extent that losses are not compensated by other sources, such as liability insurance held by the owners, operators, and guarantors of offshore facilities and vessels.

2. Title IV of the act establishes a Fishermen's Contingency Fund to compensate commercial fishermen for damages, including loss of profits for up to 6 months, due to the damage of fishing gear and vessels stemming from OCS activities. The fund establishes area accounts from which compensation is drawn; all of the Federal OCS waters off Alaska are covered by one area account. The monies for the Alaska area account derive from fees assessed against the holders of a lease, exploration permit, easement or right-of-way on the Alaska OCS in amounts determined by the Secretary of the Interior. Each area account can be funded to a maximum of $100,000 and the law specifies procedures for replenishing the account when depleted to less than $50,000.

Compensation for gear damage is limited to repair costs or the amount of replacement cost less salvage value, whichever is least. Claims are presumed valid upon filing a report within 5 days after the date when the damage or loss is discovered. The report must specify a number of items which establish the vessel was used in commercial fishing activity and was located in an area affected by OCS operations, and that no record existed on nautical charts or Notice to Mariners of the obstruction causing damage and no marker or lighted buoy spotted the location of the obstruction. A more extensive claim report must be filed no later than 60 days after the date the claimant discovers the damage.

As with the Offshore Oil Pollution Contingency Fund, the Fishermen's Contingency Fund shall not provide compensation if compensation is available from another source, such as a financially responsible party or insurance. Also, both funds become subrogated to all rights of any claimant against any person found responsible for damaging the claimant, upon payment of compensation.

Final regulations implementing the Fishermen's Contingency Fund were issued by the National Marine Fisheries Service National Oceanic and Atmospheric Administration, on January 24, 1980 (45 FR 6062) effective January 24 and February 25, 1980, and are included as appendix G.

3. A National Contingency Fund for cleanup and other removal costs of spills of oil or hazardous substances is authorized by section 311(k), the Federal Water Pollution Control Act. This revolving fund provides only for cleanup costs; damages to private citizens, such as loss of earnings, are not covered.

Environmental Studies Program: The OCS Lands Act, as amended, authorizes the Secretary to conduct studies in areas or regions of lease sales to assess and manage the "environmental impacts on the human, marine, and coastal environments of the Outer Continental Shelf and the coastal areas which may be affected by oil and gas development" (43 U.S.C. 1346). Studies in the Cook Inlet/Shelikof Strait area are described in section III.G.

The act specifies that studies will be conducted in a proposed lease area at least 6 months prior to the conduct of a lease sale. The act also emphasizes studies which develop information necessary for "assessment and management of environmental impacts," and studies designed to predict impacts on the marine biota resulting from chronic low-level pollution or large spills, from the introduction of drill cuttings and muds, and from the laying of pipelines. Subsequent to leasing, the Secretary shall conduct such additional studies as necessary to identify any significant changes in the quality and productivity of such environments, to establish trends in the areas studied and monitored, and to design experiments for identifying the causes of such changes.

The National Outer Continental Shelf (OCS) Advisory Board and the Intergovernmental Planning Program: The National OCS Advisory Board has been reorganized into a policy committee, a scientific committee, and six regional technical working group committees. The policy committee will perform the board's historic function of advising the Secretary of the Interior on OCS policy matters. The scientific committee will make recommendations to the Department concerning the scope and direction of the Bureau of Land Management's Environmental Studies Program.

The technical working groups participate in a new program that has been established to provide a formal mechanism for regional coordination and planning of three elements of the OCS program administered by the BLM: 1) the leasing process, 2) the Environmental Studies Program, and 3) OCS oil and gas transportation planning. Called the Intergovernmental Planning Program (IPP) for OCS Oil and Gas Leasing, Transportation, and Related Facilities, the program has been initiated in Alaska by the Alaska Regional Technical Working Group. The committee's membership has the requisite expertise to advise the Director, Bureau of Land Management, on detailed, technical issues throughout the OCS program.

The IPP constitutes a cooperative planning process among Federal and state agencies, private interests, and the petroleum industry. The program is designed to coordinate working group activities with the major steps and decision points in the OCS leasing and development process. To accomplish this, meeting agendas are developed around four phases, each with specific objectives, beginning prior to the Call for Nominations and Comments for a lease sale, and continuing up to the time development plans are submitted for the sale area. There will be an initial period during which the phases in the program must be modified since the OCS program in each region is now beyond the point of the Call for Nominations for the first sale. The following paragraphs summarize the major issues and the intended results of each phase.

During Phase I, which begins prior to the Call for Nominations, the Alaska Group will: 1) identify regional OCS issues and data needs, 2) make tract selection recommendations, 3) advise BLM on environmental statement development scenarios and lease stipulations, and 4) preliminarily identify potential pipeline corridors for future study. This phase could last about 2 years and will be completed by the time of a sale decision.

Phase II will be implemented at the time of the sale decision. The Alaska working group will recommend transportation-related studies for inclusion in BLM's Regional Studies Plan. Other proposed studies may also be identified to be funded and conducted by other Federal or state agencies. These regional

studies should be completed prior to completion of Phase II, which could extend over a 2- or 3-year period, and end with the first commercial discovery in the proposed sale area.

At this point, a sub-state working group will be formed to continue refining potential pipeline corridors that would affect specific areas in Alaska. The state working group would include all Federal and private members in addition to ad hoc members of affected areas. Phase III will begin with the first marketable discovery in the region and will involve the design and implementation of a site-specific studies plan. These studies will be based upon the results of the regional studies and will provide the data needed to develop a Transportation Management Plan (TMP).

Phase IV begins with the completion of the site-specific studies and consists of preparation of a TMP. The TMP will include the identification and analysis of alternative pipeline corridors, the description of onshore areas suitable for the location of pipeline support facilities, an evaluation of surface vessel transportation alternatives, and identification of stipulations or use restrictions for applications to pipeline rights-of-way.

BLM will use the TMP in developing policies for granting pipeline rights-of-way. The TMP should be completed prior to submission of the first development and production plan for the region in order to provide information to the company preparing the transportation component of the plan and to BLM for reviewing pipeline rights-of-way applications.

D. Federal Regulatory Responsibilities

Department of the Interior: BLM and USGS are departmental agencies with direct OCS regulatory and enforcement authority. BLM implements the OCS leasing regulations under 43 CFR Part 3300 and cooperates with USGS and other Federal agencies to develop special stipulations that apply to either specific leases or all leases within the proposed lease area. These stipulations address such matters as cultural and biological resources, pipeline rights-of-way, disposition of drilling wastes, and equipment identification. In addition to issuing leases, BLM issues rights-of-way for common carrier pipelines on the OCS. BLM also issues permits and designates an authorized officer to manage each permit relative to protection of coral in the vicinity of proposed OCS operations.

USGS administers regulations governing mineral operations and development of the OCS under 30 CFR Part 250. These regulations are the basis for OCS operating orders which apply to operations in the proposed lease area. See appendix C for a discussion of USGS Gulf of Alaska operating orders for this proposal. Additionally, USGS maintains jurisdiction over producer-owned gathering lines and flowlines on the OCS.

The U.S. Fish and Wildlife Service (FWS) shares responsibilities with other agencies for protection of fish and wildlife resources and their habitats, and acts in an advisory capacity in the formulation of OCS leasing stipulations. It also provides recommendations to the Corps of Engineers in the issuance of Federal permits to industry for construction in navigable waters. FWS is also responsible for the protection and stewardship of certain species covered under the Endangered Species Act of 1973.

U.S. Army Corps of Engineers: The OCS Lands Act provides authority to the Secretary of the Army to prevent obstruction to navigation in U.S. navigable waters, and to prevent obstructions caused by structures located on the OCS. Section 10 of the Rivers and Harbor Act of 1899 (30 Stat. 1151) requires that permits be issued for all offshore construction, including pipelines, in U.S. navigable waters.

Permits must also be issued for onshore facilities in which dredging and filling of U.S. navigable waters are involved. Structure permits for exploration drilling vessels and for fixed and mobile platforms are issued by the Corps. Environmental requirements must be considered prior to issuance of permits for structures in state waters pursuant to section 404 of the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977. Section 404 also delegates regulatory authority to the Secretary of the Army for discharge of dredged or fill material in wetlands.

Department of Transportation (DOT): The OCS Lands Act grants authority to the Coast Guard to promulgate and enforce regulations covering lighting and warning devices, safety equipment, and other safety-related matters pertaining to life and property on fixed OCS platforms and drilling vessels. Through the Coast Guard, the Department of Transportation advises the Corps of Engineers on the issuance of permits and the placement of offshore structures. Under the Port and Tanker Safety Act of 1978, the Coast Guard has the authority to establish shipping safety fairways and other ship routing systems in which OCS structures may be prohibited. The Coast Guard also has jurisdiction to enforce the Clean Water Act of 1977 on the OCS.

Under the Federal Water Pollution Control Act, the Coast Guard approves the procedures to be followed and the equipment used for the transfer of oil from vessel to vessel and between onshore and offshore facilities and vessels. The Coast Guard also conducts pollution surveillance patrols to detect oil discharges within territorial and contiguous waters and has enforcement authority over violations. Should an oilspill occur, the Coast Guard also has strike team responsibilities under the National Oil and Hazardous Substances Pollution Contingency Plan, as provided by the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977.

The Materials Transportation Bureau is responsible for establishing and enforcing design, construction, operation, and maintenance regulations for pipelines. The Department of Transportation's responsibility and authority is further defined in a Memorandum of Understanding between it and the Department of the Interior.

Department of Commerce: The Department of Commerce, through the National Oceanic and Atmospheric Administration (NOAA), is responsible for protection of marine fisheries resources and their habitats, and for providing recommendations to the Corps of Engineers as the entity which issues permits in navigable waters.

The Department's responsibilities and authorities related to OCS development include the Fishery Conservation and Management Act of 1976, the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, the Fur Seal Act of 1966, title II of the Marine Protection, Research, and Sanctuaries Act of 1972 ("Comprehensive Research on Ocean Dumping"), and the National Ocean Pollution Research and Development and Monitoring Act of 1978.

Coastal Zone Management Act: The Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451-1464) (CZMA) is administered by NOAA. The CZMA establishes a procedure for each coastal state to develop a management program for the sound management of state coastal resources. The act provides Federal grants for both development and implementation of these programs; in order to be implemented each program must be approved by the Secretary of Commerce. The act also creates a grants and loans program for participating states that must deal with the coastal zone impacts of OCS oil and gas and other energy development.

Section 307 of the CZMA contains the Federal consistency provisions which impose certain requirements on Federal agencies to comply with approved state coastal zone management programs.

Section 307(c)(1) requires Federal agencies conducting or supporting activities directly affecting the coastal zone to be consistent to the maximum extent practicable with a state's coastal program. This requirement applies to pre-lease activities which lead up to the actual lease sale. Pursuant to NOAA's Federal consistency regulations (15 CFR Part 930), prior to a lease sale the Department must first determine if the pre-lease activities "directly affect" the coastal zone. If so, the Department must prepare a consistency determination and submit it to the state. If not, the Department makes a "negative determination."

Section 307(c)(3)(A) prohibits Federal agencies from issuing a license or permit for any activity that affects a land use or water use in the state's coastal zone until a state with an approved coastal zone management program has agreed or can be presumed to agree that the activity subject to the license or permit is consistent with the approved program, or until the Secretary of Commerce has overridden the state's objections to the activity.

Section 307(c)(3)(B) of the CZMA consistency provisions is very important to OCS resource development. This provision requires that no Federal license or permit for an activity described in detail in an OCS exploration plan or development and production plan which affects a land use or water use in the coastal zone may be approved until a state with an approved coastal zone management plan has concurred in the consistency determination made by the lessee or until the Secretary of Commerce has overridden the state's objections.

Finally, under Section 307(d), Federal agencies may not provide Federal assistance to a state or local government for proposed projects affecting the coastal zone that are inconsistent with a State's coastal management program except upon certain findings by the Secretary of Commerce. These Section 307 provisions will have important implications for any exploration, development, and production of OCS oil and gas resources and associated onshore development.

Under the Marine Protection, Research, and Sanctuary Act of 1972 (16 U.S.C. 1431-1434), the Secretary of Commerce is empowered to designate areas as marine sanctuaries "as necessary for the purpose of preserving or restoring such areas for their conservation, recreation, ecological, or esthetic values," following consultation with the Secretaries of State, Defense, Interior, and Transportation, with the Administrator of EPA, and with other interested agencies. Once an area is designated a marine sanctuary, NOAA's Office of Coastal Zone Management is required to issue "necessary and reasonable regulations" for control of activities permitted within the marine sanctuary.

Multiple uses (including oil and gas development) could be permitted within a marine sanctuary, providing these uses are consistent with the regulations governing the sanctuary.

Department of Energy (DOE): With respect to OCS leasing, and in consultation with the Secretary of the Interior, DOE is authorized under the Department of Energy Organization Act, (91 Stat. 565 1977) to foster increased competition for leases, to implement authorized systems of bidding, to establish due diligence requirements for OCS operations, to set rates of production for leases, to define handling of royalty production, and to determine amounts of OCS gas purchased and transported. DOE has broad authority over approval, design, and economies of common carrier gas pipelines.

In addition, DOE provides support to the Leasing Liaison Committee, whose function is to coordinate leasing policies of the Department of the Interior with DOE policies. Section 27 of the OCS Lands Act, as amended, requires DOI consultation with DOE concerning the disposition of Federal royalty oil.

The Federal Energy Regulatory Commission (FERC), within DOE, has the authority under the Natural Gas Act to issue certificates of public convenience and necessity for proposed projects involving the transportation or sale of natural gas in interstate commerce. All natural gas produced from the OCS is considered to be interstate and, therefore, is subject to FERC jurisdiction. The Natural Gas Act, the National Environmental Policy Act, and OCS Lands Act Amendments of 1978 all grant authority for or require that the FERC investigate the environmental effects of a proposed offshore project, as well as the potential gas reserves, the need for this gas, and the availability of capital to develop this resource. Also, the FERC is primarily responsible for administering and enforcing the Natural Gas Policy Act (NGPA) of 1978 (92 Stat. 3350). As applied to OCS matters, the NGPA provides new wellhead pricing controls for certain natural gas produced from the OCS.

Environmental Protection Agency: The Federal Clean Water Act, as amended (33 U.S.C. 1251, et. seq.), provides several authorities applicable to wastewater discharges from OCS operations. These authorities are administered by the EPA and include the following:

> Section 403(c) of the act requires EPA to promulgate ocean discharge criteria which consider the effects of pollutants disposed upon multiple ocean use objectives. When these criteria are promulgated, they are to be used as guidelines in EPA's issuance of National Pollutant Discharge Elimination System (NPDES) permits. EPA has yet to promulgate the criteria but is under court order to do so. (Pacific Legal Foundation v. Costle, Civ. No. S-79-429-PCW, East. Dist. Calif., June 21, 1979.)
>
> Section 301(b)(1)(a) of the act requires EPA to issue effluent limitations for existing point sources of wastewater discharge which reflect the application of "best praticable control technology currently available" (BPTCA or BPT; 33 U.S.C. 1311(b)(1)(a)). The BPTCA standards would apply to existing OCS exploratory drillships, semisubmersible vessels, jack-up rigs, etc., used in exploration operations.
>
> Section 301(b)(2)(a) requires EPA to promulgate effluent limitations for categories and classes of point sources which shall require application

of "best available control technology economically achievable" (BAT). The limitations regard toxic pollutants identified in the act and would apply to both exploration and production operations on the OCS.

Section 306(b)(1)(B) of the act requires the EPA to promulgate Federal standards of performance in pollution control from new sources for categories and classes of industries designated either in the act or at the Administrator's discretion.

Section 307(a)(1) of the act requires the EPA to promulgate a list of toxic pollutants for purposes of pollution control. Section 307(a)(2) requires the EPA to promulgate effluent limitations for each of the identified toxic pollutants.

Section 402(a)(1) of the act confers permitting authority upon the EPA to meet the regulatory responsibilities of several sections of the act, e.g. sections 301, 306, and 307 mentioned above. The National Pollution Discharge Elimination System (NPDES) falls under this section of the act; it applies to all sources of wastewater discharges from exploratory vessels and production platforms operating on the OCS.

Presently, EPA requires drilling fluids to be discharged at a rate less than a 30 bbl/hr along with a dilution ratio of 40:1 bbl seawater to discharge fluid. This limitation is imposed during the season of commercial crustacea reproduction and larval growth. EPA also presently imposes a limitation on aromatic hydrocarbons of 10 ppm. EPA also imposes a standard of no free oil discharge with deckdrain wastes and an oil and grease standard of 48 mg/l average or 78 mg/l maximum in the oil/water separator discharges.

USGS Operating Orders for its OCS operations in the Gulf of Alaska include an order No. 7 "Pollution Prevention and Control." Sections 1.1.1 and 1.1.4 of order No. 7 reference EPA authority over regulation of drilling fluids, deckdrainage, produced waters, and sanitary wastes (44 FR 76246-47). Refer to appendix C of this EIS for an analysis of the USGS Operating Orders for the Gulf of Alaska.

The Clean Water Act (91 Stat. 1566 (1977)), which amended the FWPCA, also applies to offshore operations and provides that lessees or operators be held financially liable for damages due to oilspills. It provides for a liability up to $50 million for actual costs of oil removal and cleanup (except where without fault of operator or owner), as well as replacement or restoration costs of natural resources damaged or destroyed by a spill.

EPA is also primarily responsible for facilities not related to transportation, such as terminal and storage facilities, and permits for any discharges would be issued by EPA or designated states according to established effluent guidelines. Provisions of the Clean Water Act also apply to onshore facilities and OCS-related activities.

Interstate Commerce Commission: The Interstate Commerce Commission grants approval of the tariff rates for transportation of oil by common-carrier pipelines.

E. Relationship of the Proposed Sale to the Overall OCS Leasing Program: In compliance with the act, the Secretary of the Interior submits a new proposed 5-year leasing program to the Congress, the Attorney General, and the governors of affected states. The Secretary is further directed to prepare, periodically revise, and maintain the oil and gas leasing program. The leasing program is to consist of a schedule of proposed lease sales indicating, as precisely as possible, the size, timing, and location of leasing activity which will best meet national energy needs for the 5-year period following its approval or reapproval. The goal of the leasing program is to provide for orderly development of OCS oil and gas resources and to maintain an adequate contribution of OCS production to the national supply in order to reduce dependence on foreign oil. The current 5-year leasing program, covering the period from mid-1980 through mid-1985, was approved by the Secretary in June 1980, and schedules sale 60 for September 1981.

The United States has three overriding energy objectives outlined in the National Energy Plan:

> as an immediate objective that will become even more important in the future, reduce dependence on foreign oil and vulnerability to supply interruptions;
>
> in the medium term, to keep U.S. imports sufficiently low to weather the period when world oil production approaches its capacity limitation; and
>
> in the long-term, to have renewable and essentially inexhaustible sources of energy for sustained economic growth.

Full development of OCS resources is an integral part of that plan (the National Energy Plan, Executive Office of the President, Energy Policy and Planning, 1977).

The DEIS on the proposed 5-year OCS oil and gas lease schedule was released in August 1979. Public hearings were held in Anchorage in October 1979 and the FEIS was published in January 1980. The final 5-year schedule, which runs through May 1985, was approved by the Secretary in June 1980.

An OCS leasing program does not represent a decision to lease in a particular area. It represents only the Department's intent to consider leasing in certain areas, and to proceed with the leasing of such areas only if it should be determined that leasing and development in such areas would be environmentally, technically, and economically acceptable.

As reflected in the final OCS oil and gas leasing schedule (June 1980), proposed sale 60 in the lower Cook Inlet/Shelikof Strait is scheduled for September 1981. Another proposed sale in the area is sale 61 (Kodiak), scheduled for April 1983. Sale 61 will encompass the same area of call as the now cancelled sale 46.

F. Results of the Scoping Process for Proposed OCS Sale 60: Due to the proximity, both in timing and location, of lease sales 46 and 60, an attempt was made to combine, whenever possible, the scoping efforts for the two sales. Many of the concerns and opinions expressed in regard to sale 60 were also expressed in previous meetings on sale 46. Public concern, especially in

Kodiak, is equal for both sales, however, due to fishing season activities and the attainment of the public's threshold on meetings, the open scoping sessions conducted in August 1979 were not as well attended as previous meetings. For this reason, the reader is invited to review section I.F. of the 1979 DEIS for lease sale 46 for additional insights into the concerns of the citizens of the affected area.

Three public scoping meetings were held for sale 60. The first was a combined sale 46 and 60 session and was held in Anchorage on May 23, 1979. The meeting was advertised in the Anchorage papers as a public gathering. At the Anchorage meeting seven people participated. Four of the participants were from oil companies (ARCO, Marathon, Shell, and Texaco), one was from a Native corporation, one was from the Matanuska-Susitna Borough, and the last individual represented the municipality of Anchorage. The concerns raised are shown below.

Issues Surfaced:

Proceed with the proposal.

The adequate treatment of environmental constraints on oil and gas operations.

Onshore impacts on the social and economic environment.

The second public scoping meeting was held on August 14, 1979, in the Kodiak Island Borough Assembly Hall. The turnout was low. There were only 11 people present to represent the people of Kodiak. The results of the meeting are as follows.

Issues Surfaced:

Cumulative effects of lease sale 60 and the since-cancelled sale 46.

Impacts on the bottomfishing industry in particular, and fisheries resources in general.

Lack of fisheries and oceanographic studies regarding Shelikof Strait.

Impacts on the island's socioeconomic infrastructure, i.e., housing, social services, etc.

The need for clearly defining shipping lanes.

The handling, fate, and effects of drilling muds and cuttings.

Suggested Mitigating Measures:

Elimination of all blocks south of number 1055.

Cancellation of the lease sale.

The final public scoping meeting was held in Homer on August 17, 1979. Again turnout was low; six individuals were in attendance. The individuals present; however, represented a broad spectrum of local society. They were the Honorable Don Gilman, Mayor of the Kenai Peninsula Borough; Ms. Randy Somers of public radio station KBBI; Mr. Joseph Wills, editor of the Homer News; Mr. Kenton Bloom of the Kachemak Bay Conservation Society; Bob Ducker, president of the Kenai Peninsula Fishermen's Cooperative Association; and Ms. Lettie Edleman, vice president of the same organization. The issues of concern that were raised and mitigating measures suggested were as follows.

Issues Surfaced:

Possible interference with the commercial fishing operations. Specifically, the driftnet salmon fishery, shellfish, and bottomfish fisheries.

Land use and coastal management impacts particularly in regard to facilities siting.

Impacts on the socioeconomic infrastructure.

Impacts as a result of increased vessel traffic.

Proper enforcement of existing regulations.

Environmental data gaps in the Cook Inlet.

Water quality, i.e. discharge of muds and cuttings.

Impacts of a lengthy pipeline under the Cook Inlet.

Suggested Mitigating Measures:

Deletion of all blocks north of a line composed of blocks 266 through 276, as listed on protraction diagram no. 5-2.

Hypothetical facility sites used in this document should comply with and be coordinated with any borough coastal zone management program.

In light of the low turnout at Homer, it was decided to send letters to each of the attendees to request additional information and to urge them to ask their constituencies to contact the Alaska OCS Office in writing and register their concerns. As a result of our requests: radio station KBBI boradcast public service messages telling their listeners that we wanted to hear from them; the Homer News published a January 10 article informing their readers of our desires for additional input, and finally, in their January Newsletter, the Kachemak Bay Conservation Society requested their members to contact the BLM/OCS office and indicate their concerns. As a result of these efforts the BLM/OCS office received two letters. One letter was received from Mayor Gilman and one letter from Ms. Joy Post of Homer. The issues which were outlined in the letters will be summarized at the end of this section with the rest of the written comments.

Three scoping meetings were held which involved State and Federal personnel. The first meeting was held in Anchorage on May 14, 1979. The meeting was a combined sale 46 and 60 effort; it drew eight people. The attendees represented the National Oceanic and Atmospheric Administration (NOAA), the National Marine Fisheries Service (NMFS), the Heritage Conservation and Recreation Service (HCRS), the Fish and Wildlife Service (FWS), the Geological Survey (USGS), and the Alaska Department of Fish and Game (ADF&G). The results are as follows.

Issues Surfaced:

Impacts on the socioeconomic environment which would result from the development phase of OCS activity.

Proceed with the proposal.

The importance of assessing and including viable mitigating measures within the EIS including pipeline, cultural, resource, and orientation program stipulations.

Onshore impacts on the biological environment.

The adequate treatment of environmental constraints on offshore oil and gas operations.

The second meeting took place in Juneau on May 19th, 1979. This meeting was supposed to be a combined sale 60/sale 46 scoping session. The Juneau meeting was not well attended. Representatives of the Coast Guard and one employee of the Alaska Department of Health and Social Services attended. No issues of significance were surfaced.

The third Federal scoping meeting took place on February 1, 1980. The meeting involved the inhouse BLM/OCS staff. The results of the scoping activities were analyzed during this gathering. As a consequence of the meeting, alternative VI was added to the DEIS and the issue of subsistence was elevated as a topic of concern.

On March 5, 1980, a final scoping meeting was held in Kodiak. The purpose of the gathering was to receive the comments of members of the Kodiak Area Native Association, Overall Economic Development Committee. This committee represents the Native villages of Kodiak Island. The results of the meeting are as follows.

Issues Surfaced:

Impacts to subsistence activities.
Impacts to commercial fisheries.
Cumulative effects of sales 46 and 60.
Impact of sale 60 on the delivery of services to the villages.
Impacts on endangered species and marine mammals.
Limiting access by oil and gas workers to Native villages.

Suggested Mitigating Measures:

Orientation program for all oil and gas workers.
Any oil and/or gas terminal should be set apart in an enclave similar to the enclave created outside Yakutat following OCS sale 39.

As a result of scoping activities, the Alaska OCS Office received a total of nine written comments from the following organizations and individuals: Department of the Interior; Bureau of Land Management; Alaska State Director; Assistant Conservation Manager, Alaska Area, USGS; Heritage Conservation and Recreation Service; Department of Energy; Coast Guard; Kenai Peninsula Fishermen's Cooperative Association; Mayor Don Gilman of the Kenai Peninsula Borough; Mayor George Sullivan of Anchorage; and Ms. Joy Post of Homer.

Their suggestions for further focus in the DEIS included discussion of:

Impacts on all commercial crab species.
Impacts on bottomfish and the bottomfish industry.
Impacts on the salmon fisheries, specifically the drift net salmon fisheries.
Economic impacts occurring onshore to the fisheries industry.
Impacts on marine mammals and endangered species.
Impacts on recreation, tourism, and wilderness values.
Impacts on land use.
Impacts on cultural resources.
Impacts on the marine transportation systems.
Likelihood and severity of pollution events.
Impacts on subsistence activities and lifestyle.
Impacts on social services and socioeconomics, in general.
Seismic hazards within the sale area.

It should be noted that all organizations, government agencies, and individuals listed in the foreword of this DEIS were invited to attend the various scoping meetings and/or submit their written comments.

The results of these meetings and the issues raised in the written comments were analyzed by the EIS team during the early months of 1980. Concerns raised during the scoping efforts conducted for sale 46 were also considered. The following major issues and alternatives were determined from this analysis. They are the principal foci around which this EIS developed (CEQ regulations 1501.7).

Major Issues Surfaced:

1. Impacts on the commercial fisheries industry.
2. Cumulative effects impacts.
3. Impacts on land use and coastal zone management.
4. Local socioeconomic impacts.
5. Marine transportation impacts.
6. Environmental data gaps.
7. Impacts on subsistence activities.
8. Impacts on water quality.
9. Geological hazards.

Alternatives:

The proposal as stated, lease all 153 blocks.

Deletion of all blocks south of block 1055. This action would result in a total deletion of 81 blocks all within the Shelikof Strait. Alternative V has fully embraced this deletion option. Alternative IV reflects the same option only to a modified degree.

Deletion of all blocks north of a line from block 266 through block 276. Such an action would result in the deletion of 19 blocks all within the lower Cook Inlet. This option has been included in alternatives IV and V.

The inclusion of a Shelikof-only option. This alternative would result in the deletion of 86 blocks contained in the lower Cook Inlet and would limit saleable blocks to the Shelikof Strait. The Shelikof-only option is advanced in this EIS as alternative VI.

The bulk of the discussion which follows within the DEIS is confined to the aforementioned issues and alternatives. The specificity of the analytical focus is in keeping with the intent and purposes of the CEQ regulations. The objectives of the CEQ regulations are to produce a more precise, easily understandable document which can function more effectively as a decisionmaking tool. In order to accomplish this task it is imperative that major issues surfaced within the scoping process receive the greater share of analysis within this document. Of necessity, secondary issues are treated less extensively.

II. ALTERNATIVES INCLUDING PROPOSED ACTION

This section describes the proposed action and each alternative to the proposed action. It also outlines the various production assumptions, development scenarios, resource estimates, and mitigating measures which shape the environmental analysis contained within this document. Finally, this section includes a summary of probable impacts of the proposed action and each of its alternatives.

A. Resource Estimates and Production Assumptions: Undiscovered recoverable resources are those quantities of oil and gas which are reasonably expected to exist in favorable geologic settings, and which after discovery, can reasonably be expected to be produced with present technology and economic conditions. If exploration confirms the existence of recoverable oil and gas, such resources are reclassified as reserves.

The resource estimates used in this EIS assume that favorable geologic conditions exist so that oil and gas are present and are contained in traps within the proposed lease area in commercial quantities. However, there is a 95 percent probability that no commercial resources will be discovered or a 5 percent chance that commercial resources will be found within the proposed lease sale area. This degree of risk is applicable to all alternatives discussed within this EIS. The proposed lease area is, therefore, considered to be a high risk area in terms of discovering commercial oil or gas. This risk factor is subject to modification as more is learned about the area. Any citation of this unrisked resource data should clearly state that the information assumes discovery. Estimates of resource potential are inherently speculative, particularly in areas where geologic information is limited and the presence of oil and gas has not been demonstrated.

The method used to develop the resource estimates involved an analysis of geophysical and geologic information on subsurface and adjacent surface formations. This information became the input to engineering and economic calculations to determine minimum commercial field sizes. These minimum field sizes, plus the hydrocarbon structure information were statistically blended in a model using a Monte Carlo (random) technique to produce the proposed lease area's commercial resource distribution curve. Then, assuming that commercial resources were found, the minimum case, the mean case, and the maximum case were then rerun using a Monte Carlo technique to determine production factors such as number of wells and reservoir decline patterns.

The resource estimates include primary production only; no assumption has been made regarding secondary recovery. Improvement of drilling technology and exploration science might increase the estimates. Differing assumptions regarding exploration and development costs, operating expenses, the price and market for oil and natural gas, taxes, depreciation, and royalty and production rates would affect the estimates of the recoverable resources. Similarly, a significant change in one or several of these factors in the future could affect the amount of resources actually recovered.

The Geological Survey has estimated the maximum resource (5%) level, the mean, and the minimum resource (95%) level of recoverable oil and natural gas resources within the proposed lease area as follows:

	Maximum	Mean	Miminum
Oil (MMbbls)	1,015	670	332
Natural Gas (Bcf)	1,776	1,173	581

The indicated resources are based upon unrisked statistical resource estimates.

Information exists for a reasonable resource for each alternative. Accordingly, the environmental analysis of each alternative is based on the assumption that resource development would result in the following production estimates:

	Alt. IV	Alt. V	Alt. VI
Oil (MMbbls)	260	180	335
Natural Gas (Bcf)	456	360	586

Alternative I is represented by the mean resource level of the proposed action. Alternative II is the no sale case. Alternative III portrays a situation in which the sale of the blocks in question is delayed 2 years. Resource estimates indicated for alternatives IV, V, and VI are all variations of the mean resource level estimate.

For the development scenario of the proposed action, crude oil produced in the lower Cook Inlet is hypothesized to be transported via pipeline to an oil storage and tanker loading terminal constructed at a point between Anchor Point and Stariski Creek. Crude oil extracted from the Shelikof Strait is hypothesized to be transported by pipeline to an oil storage and tanker loading terminal located near Talnik Point on the shore of Marmot Bay. Natural gas produced in both the Shelikof Strait and the Cook Inlet would be piped to a gas compressor station located on or near the Anchor Point terminal. From Anchor Point, the gas would be transported via pipeline to Nikiski where it would be liquefied at the present Phillips or proposed Pacific LNG plant and thereupon transported to market.

In regard to alternatives IV and V, all oil and gas produced would be transported by pipeline respectively to Anchor Point and Nikiski. No facilities are forecast for construction on any portion of the Kodiak Archipelago for either alternative IV or V. Alternative VI would require all extracted oil to be transported by pipeline to a tanker loading terminal at Talnik Point. Produced gas would be reinjected into the formation.

The lower Cook Inlet scenario of the proposed action represents just one option by which the resources extracted as a result of sale 60 could be processed. The purpose of the development scenarios of this EIS is to provide a reasonable framework within which the possible impacts of oil and gas activities may be judged. Given the projected decline of oil and gas production in the upper Cook Inlet, excess refining and storage capacity at existing facilities could increase to the point that would allow the introduction of lower Cook Inlet production, into the future hydrocarbon infrastructure of the upper Cook Inlet, in a variety of ways different from that outlined in the proposed action.

No facilities exist on either Kodiak or Afognak Islands to handle hydrocarbons produced from the Shelikof Strait. In regard to industry, the islands are largely undeveloped. Several facility sites have been identified as being physically adequate (excluding biological considerations) for development

(fig. II.A.-1). The location and construction of a pipeline to an oil storage terminal at Talnik Point is just one of several options. For a review of potential development sites for hydrocarbons produced in the Shelikof Strait, the reader is directed to the following works: "Oil Terminal and Marine Service Base Sites in the Kodiak Island Borough," Woodward and Clyde Consultants, 1977, Anchorage, Alaska; and "Lower Cook Inlet/Shelikof Strait Petroleum Development Scenarios, "Technical Report No. 43," prepared by Dames and Moore for the BLM Alaska OCS Office, 1980, Anchorage, Alaska.

Figure II.A.-1 shows some of the other sites which appear to be physically capable of hosting facilities should they be required. Even if required, most of the sites would not be used, since several possibilities have been shown for each single site requirement. Conceivably, none of the sites may be used if other factors (community resistance, land use policies, restrictive zoning, etc.) limit or cause industry disinterest in these sites, and if other physically capable sites are made more attractive. Because of the many assumptions involved, this analysis is not intended as, nor should it be used as, "a local planning document" by potentially affected communities, nor is it a forecast or prediction of the future. All facility locations/scenarios throughout this EIS are intended to represent only a few plausible locations/scenarios that presently seem likely. They serve only as a basis for identifying characteristic activities and resulting impacts for this EIS and do not represent a BLM recommendation, preference, or endorsement of facility sites, or development schemes.

B. Analysis of Proposal and Alternatives

1. Alternative I (Proposal):

a. Description of the Proposal: The proposed Federal action under consideration (fig. II.B.1.a.-1) is the leasing of 153 blocks in lower Cook Inlet, and northern portion of the Shelikof Strait. Each block is approximately 3 by 3 miles. These blocks cover an area of approximately 349917 hectares (864,646 acres), and are located from 5 to 37 kilometers (3 to 23 mi) offshore in water depths that range from 15 to 210 meters (49 to 689 ft). A summary of these blocks by water depth and distance to shore is in appendix F of this DEIS.

In November of 1979, the Geological Survey (USGS) estimated that based on geophysical data, the 161 blocks offered for lease by this proposal may contain undiscovered recoverable resources ranging from 332 to 1,015 MMbbls of oil and from 581 to 1,776 Bcf of natural gas. Based on these estimates, the proposed action may result in a peak daily production of between 151,500 and 342,200 barrels of oil, and between 265.2 and 598.9 MMcf of gas per day.

Basic Development Assumptions: Environmental, social, and economic impacts may occur as a result of a Federal decision to permit exploration for a commercially producible offshore gas field. Estimated levels of oil and gas discovered are a prime determinant in estimating the amount of activity and impact caused by such a decision.

The focus of the statement is on the probability that commercial quantities of hydrocarbons will be found. Further, discussion of oil and gas development activity centers on the more probable intermediate level of assumed resource

FIGURE II. A. 1

EXISTING AND POTENTIAL OIL TERMINAL SITES

INDICATES EXISTING PETROLEUM FACILITY SITES

INDICATES POTENTIAL MARINE OIL TERMINAL SITES.

155° 154° 153° 152° 151°

60°

59°

58°

Redoubt Bay

COOK INLET

KENAI PENINSULA

Kachemak Bay

Kamishak Bay

Kennedy Entrance

Stevenson Entrance

GULF OF ALASKA

ALASKA PENINSULA

STRAIT

Perenosa Bay

AFOGNAK ISLAND

Marmot Bay

SHELIKOF

KODIAK ISLAND

Source: Woodward & Clyde 1977
Dames & Moore 1979
Ch2M Hill 1978
BLM / OCS 1980

FIGURE II. B. 1. a.– 1

LOWER COOK INLET–SHELIKOF STRAIT
PROPOSED OCS SALE NO. 60

ALTERNATIVE I (PROPOSAL)

COMPOSITE PROTRACTION DIAGRAM
OF AREA SELECTED

AREA OF CALL

TRACTS LEASED IN SALE NO. CI

BLOCKS CONSIDERED FOR ALTERNATIVE I

OIL TERMINAL (Hypothetical)

GAS TERMINAL (Hypothetical)

NIKISKI
COOK INLET
KENAI PENINSULA
ANCHOR POINT
KACHEMAK BAY
KAMISHAK BAY
CAPE DOUGLAS
BARREN ISLANDS
ALASKA PENINSULA
AFOGNAK ISLAND
SHELIKOF STRAIT
TALNIK POINT
GULF OF ALASKA
CHINIAK BAY
KODIAK ISLAND
CAPE CHINIAK
CAPE IKOLIK

Source: Alaska Outer Continental Shelf Office 1980

discovery (the mean case) rather than the more extreme minimum or maximum cases. The minimum and maximum cases are discussed in appendices A and B.

Estimated Activity Resulting from the Proposal: The amount of commercial activity that may be generated in the Cook Inlet and the Shelikof Strait is dependent on many variables. Chief among these would be the amount of recoverable resources; however, also of great importance would be the availability of capital, work force, equipment, and the willingness of regional and local authorities to work with industry in the implementation of development programs. The quantity of recoverable resources (oil and natural gas) is presently unproven, and, therefore, is presented in three levels (scenarios) in order to show an estimated range of resource potential. This range of resource potential has been discussed briefly in section II.A., and is presented in detailed development scenarios and schedules of investment and production in appendix A. The following discussion will assume a degree of activity which would be associated with a mean level discovery of hydrocarbons (see resource estimates previous pages).

Estimated Activity Based on the Mean Scenario: Should the sale be held, exploration is expected to begin in 1982 and continue through 1986 with a total of 16 exploration and delineation wells drilled. No more than three rigs would be assumed to be working during any one year of the exploratory period. Drilling during the exploratory phase would be carried out by semi-submersibles, however, jack-up rigs could be used in selected locations of shallow water depths of about 61 meters (200 ft) or less.

Primary maritime support and supply activities would occur from existing hydrocarbon industry facilities located at Nikiski. Aircraft support would be launched from fields located on the Kenai Peninsula at Port Lions and, possibly, Cape Chiniak.

For the proposal (alternative I), it is assumed a total of 640 kilometers (400 mi) of pipeline would be constructed. This mileage would express itself as two separate oil and one gas pipelines. One oil pipeline system would drain the lower Cook Inlet. The pipeline would total about 128 kilometers (80 mi), and would be emplaced entirely under water, the pipeline would terminate in an oil storage terminal located between Stariski Creek and Anchor Point on the Kenai Peninsula. The second oil pipeline would service the Shelikof Strait. It could be constructed through the Kupreanof Strait to Chernof Point, and then overland to the vicinity of Talnik Point. A Talnik Point facility would be exposed to northern weather and would require a protective breakwater. Oil tankers enroute to a Talnik Point facility would arrive from the Gulf of Alaska via Marmot Bay. Total length of the Talnik Point pipeline could be about 144 kilometers (90 mi), with 16 kilometer (10 mi) of the total allotted for overland passage. The gas pipeline would traverse both the Shelikof Strait and the Cook Inlet. It could landfall at or near the Stariski/Anchor Point oil terminal. The gas could then be pumped by a compressor station through a 70-mile overland pipeline system to Nikiski. At Nikiski the gas would be liquefied and transported to market. Total length of the gas pipeline would be approximately 230 miles.

Pipeline diameters assumed for the mean case of the proposal would be 22 inches for oil, and 18 inches for gas. Pipeline construction could begin in 1984 and finish during 1986. Standard pipe lay barges can operate in wave

Table II.B.1.a.-1
Summary of Activities Required to Develop the
Estimated Resources Within the Proposed Action
Mean Case (Alternative I)

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1. Estimated acreage, construction activity and resources:
   a. Sale Acreage Offering: 350182 hectares (864,646 acres)
   b. Exploration and Delineations Wells: 16
   C. Production Platforms: 4
   d. Production Wells: 195
   e. Workover Wells: 624
   f. Pipelines:

	Oil (22" diameter)	Gas (18" diameter)
Offshore length:	129 km (80 mi to Anchor Point) 129 km (80 mi to Chernof Point)	225 km (160 mi to Anchor Point)
Onshore length:	0 16 km (10 mi to Talnik Point)	113 km (70 mi to Nikiski)

   g. Terminal(s):

      Oil: 2 (Anchor Point and Talnik Point)
      Gas: Use existing terminal(s) at Niskiski.

   h. Recoverable Hydrocarbons:

	Oil	Gas
Total Production:	670.0 MMbbls	1,173.0 Bcf
Peak Production:	265.2 Mbbls/D	464.4 MMcf/D
Average Annual Production:	26.8 MMbbls	45.1 Bcf

2. Estimated peak annual transportation by tanker:
   Oil: 96.8 MMbbls
   LNG: 50 MMbbls

3. Estimated tonnage (2,000 lbs/ton) of commercial muds and volume of drill cuttings (assuming 16 exploration wells at 4864 meters (16,000 ft) and 195 production wells at 3040 meters (10,000 ft):

Exploration/Production

	Exploratory Period		Production Period	
	Per Well	Total Field	Per Well	Total Field
Muds:	947 metric tons (1,044 tons)	15,152 metric tons (16,704 tons)	680 metric tons (750 tons)	15,708 metric tons (17,278 tons)
Cuttings:	$539m^3$ ($704\ yd^3$)	$8,624m^3$ ($11,264\ yd^3$)	$206m^3$ ($269\ yd^3$)	$40,170m^3$ ($52,455\ yd^3$)

* Please note that during the production and development period drill mud is reused. Approximately 10 percent of the total drill mud used is lost downhole.

4. Estimated volume of formation water produced:
A prediction cannot be made at this time due to incomplete knowledge of the subsurface geology of the Shelikof Strait. However, based upon the behavior of the upper Cook Inlet field we may hypothesize that at midlife the sale 60 field will be producing one barrel of formation water for every two barrels of oil. This figure would equal some 12-15 MMbbls per year.

5. Estimated land use requirements for onshore facilities:

Support/Supply:	Existing facilities will suffice.	
Terminal(s) and related facilities:	Oil 2 terminals (49 hectares/120 acres each)	Gas 1 compressor station (16 hectares/40 acres)

6. Estimated burial disturbance of offshore pipeline (assuming 2734 m^3/km (5,750 yd^3/mi) for oil pipeline and 2377 m^3/km (5,000 yd^3/mi) for gas pipeline) will be:

Oil: 352686 m^3 (460,000 yd^3) each to Anchor Point and Chernof Point

Gas: 534825 m^3 (700,000 yd^3)

heights up to 1.5 meters (5 ft). As the weather throughout the proposed sale area is generally inclement and waves are generally higher than 1.5 meters, it is possible that larger lay barges, such as the "Viking Piper," would be used in order to minimize downtime.

Nikiski currently hosts the Phillips LNG plant. The Phillips facility is capable of processing 185 MMcf of natural gas per day. By 1982, a second LNG facility (operated by Pacific Alaska LNG Associates) will be constructed adjacent to the Phillips plant. Total processing capacity for the new plant will be 400 MMcf per day. Taken together, the combined refining capacity of the two plants should be sufficient to process any LNG produced from the Cook Inlet and Shelikof Strait.

Oil and gas production could begin by 1986. By that year, four pile supported steel tower production platforms would be installed. By 1991, some 195 production wells could have been drilled. Oil should be produced until 2011. Natural gas production would cease in 2012. The total life of the field is estimated at 26 years.

A summary of activities required to develop the estimated mean resources is on table II.B.1.a.-1.

b. Mitigating Measures in Place that are Part of the Proposed Action:

Protection of Cultural Resources: This measure was used in the analysis and considered part of the proposal.

Background: This measure as written has been widely accepted by Interior agencies throughout all OCS areas. In the past, there has been agreement that prelease cultural resources probability studies would be conducted as a basis of information for BLM to request invocation of this stipulation by the DCM. The Alaska OCS Office has sponsored these studies for the Cook Inlet/Shelikof Strait area.

> Stipulation: If the DCM, having reason to believe that a site, structure, or object of historical or archeological significance, hereinafter referred to as a "cultural resource," may exist in the lease area, gives the lessee written notice that the lessor is invoking the provisions of this stipulation, the lessee shall, upon receipt of such notice, comply with the following requirements:
>
> Prior to any drilling activity or the construction or placement of any structure for exploration or development on the lease, including, but not limited to, well drilling and pipeline platform placement, hereinafter in this stipulation referred to as "operation," the lessee shall conduct remote sensing surveys to determine the potential existence of any cultural resource that may be affected by such operations. All data produced by such remote sensing surveys, as well as other pertinent natural and cultural environmental data, shall be examined by a qualified marine survey archeologist to determine if indications are present suggesting the existence of a cultural resource that may be adversely affected by any lease operation. A report of this survey and assessment prepared by the marine

survey archeologist shall be submitted by the lessee to the DCM and the Manager, Bureau of Land Management (BLM), Outer Continental Shelf (OCS) Office, for review.

If such cultural resource indicators are present, the lessee shall (1) locate the site of such operation so as not to adversely affect the identified location; or (2) establish, to the satisfaction of the DCM, on the basis of further archeological investigation conducted by a qualified marine survey archeologist or underwater archeologist using such survey equipment and techniques as deemed necessary by the DCM, either that such operation shall not adversely affect the location identified or that the potential cultural resource suggested by the occurrence of the indicators does not exist.

A report of this investigation prepared by the marine survey archeologist or underwater archeologist shall be submitted to the DCM and the Manager, BLM OCS Office, for their review. Should the DCM determine that the existence of a cultural resource which may be adversely affected by such operation is sufficiently established to warrant protection, the lessee shall take no action that may result in an adverse effect on such cultural resource until the DCM has given directions as to its preservation.

The lessee agrees that if any site, structure, or object of historical or archeological significance should be discovered during the conduct of any operations on the lease area, he shall report immediately such findings to the DCM and make every reasonable effort to preserve and protect the cultural resource from damage until the DCM has given directions as to its preservation.

Evaluation of Effectiveness: BLM has sponsored studies in lower Cook Inlet and Shelikof Strait to evaluate the potential of cultural resources in the area. The lessee or agent, during any activities on the leasehold, is required to report any findings to the Supervisor in the event any site or object of historic or archaeologic significance should be discovered. The contractor is also required to make every reasonable effort to preserve and protect such site or object from damage until the DCM makes a determination on its preservation. There was agreement to adopt this measure at the 2974 meeting held in Washington, D.C. on July 22, 1980.

Through the imposition of this stipulation and compliance with applicable Federal and State laws regarding cultural resources, and adherence with rules, regulations, policies of the Alaska Coastal Management Program, the Kenai Peninsula Borough District Program, when approved, and the Intergovernmental Planning Program for OCS Oil and Gas Leasing, Transportation, and Related Facilities, the protection and preservation of cultural resources is assured.

c. Other Potential Sale-Specific Mitigating Measures Considered: Other mitigating measures were surfaced during the DEIS preparation process. Because formal acceptance of them has not occurred, they are noted here only as possibilities that could be utilized. The analysis in this DEIS is not based on these measures; they are not part of the proposal.

The identification of these issues led to the development of corresponding special mitigating measures, when protection was not felt to be fully afforded

by existing measures. The Alaska OCS Office studied the possible impacts, examining other lease sale proposals past and present, mitigating measures, and information to lessees. Some new measures were drafted. Secretarial Order 2974 (see appendix C) provides the primary mechanism for the intra-Departmental coordination that is employed in developing mitigating measures.

On April 8, 1980, the first 2974 meeting for mitigating measures for proposed sale 60 was held. The following mitigating measures were discussed and evaluated. Further refinement of these measures took place at field level meetings June 6 and 12, and at a headquarters level meeting in Washington, D.C. on July 22, 1980.

Potential Mitigating Measure No. 1 - Well and Pipeline Requirements:

Background: This measure was previously accepted for OCS sales 42, 48, and proposed sale 55. The intent is to mitigate potential damage to fishing gear by marine vessel traffic through pipeline design. The intent is also to mitigate cumulative effects of various projects in the area (sec. IV.A.1.h.).

> Subsea Wellhead Measure: Subsea wellheads and temporary abandonments, or suspended operations that leave protrusions above the seafloor shall be protected, if feasible, in such a manner as to allow commercial fishing trawl gear to pass over the structure without snagging or otherwise damaging the structures or the fishing gear. Latitude and longitude coordinates of these structures, along with water depths, shall be submitted to the DCM (Deputy Conservation Manager, Field Operations, Alaska Region, USGS). The coordinates of such structures will be determined by the lessee utilizing state-of-the-art navigation systems with accuracy of at lease ± 50 feet (15.25 m) at 200 miles (322 km).

> Pipeline Design Measure: All pipelines, unless buried, including gathering lines, shall have a smooth-surface design. In the event that an irregular pipe surface is unavoidable due to the need for valves, anodes, or other structures, it shall be protected in such a manner as to allow trawl gear to pass over the object without snagging or otherwise damaging the structure or the fishing gear.

The following was considered in assessing the need for and adequacy of this stipulation for the proposed lease area:

> Existing OCS Orders Nos. 1 and 3, require that all subsea objects hazardous to navigation or commercial fishing be marked by navaids as directed by the U.S. Coast Guard. OCS Order No. 3 requires that all casing, wellheads, and pilings, when abandoned, must be removed to a minimum depth of 5 meters (16 ft) below the ocean floor; and that temporary abandonments must be identified and marked, as directed by the Coast Guard, when a casing stub extends above the ocean floor.
>
> U.S. Coast Guard regulations provide for marking and protection of subsea objects and the U.S. Coast Guard has proposed regulations, 30 CFR 147 (Federal Register, May 1, 1980), which will establish "safety zones" around OCS objects. Obstructions must be accurately reported and the location published in a public notice.

Rights of-way are subject to environmental safety assurance through regulations requiring best available and safest technology and regulatory and CZM consistency reviews (OCS Lands Act, Section 5(e), as amended).

Evaluation of Effectiveness: Although the wording of this mitigating measure has become standard, other existing measures, as discussed above, may adequately preclude the need for a special stipulation. The paragraph in the stipulation concerning pipelines was considered to be more appropriate to the stipulation for transportation of hydrocarbon products. However, due to the high value of fisheries in the area, this standard measure should be adopted. There was agreement to adopt this measure at the 2974 meeting held in Washington, D.C. on July 22, 1980.

Potential Mitigating Measure No. 2 - Transportation of Hydrocarbon Products:

Background: The following measure was accepted for proposed OCS sales 42, 48, and 55 (open ocean areas). The intent of the stipulation is to protect pipelines from damage by climatic, geologic, or human factors, and from various traffic and projects to an area. This measure, however, does not specifically permit new offshore loading terminals.

Pipeline Requirement Measure: Pipelines will be required a) if pipeline right-of-way can be determined and obtained; b) if laying such pipelines is technically feasible and environmentally preferable; and c) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple-use conflicts. The lessor specifically reserves the right to require that any pipeline used for transportation production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to any recommendation of the intergovernmental planning program for assessment and management of transportation of Outer Continental Shelf oil and gas with participation of Federal, State, and local government and industry. All pipelines, including both flow lines and gathering lines for oil and gas, shall be designed and constructed to provide for adequate protection from water currents, storms, subfreezing conditions, fisheries trawling gear, and other hazards as deterimined on a case-by-case basis.

Following the development of sufficient pipeline capacity, no crude oil will be transported by surface vessel from offshore production sites, except in the case of emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the DCM (Deputy Conservation Manager, Field Operations, Alaska Region, USGS).

Where the three criteria set forth in the first sentence of this stipulation are not met and surface transportation must be employed, all vessels used for carrying hydrocarbons to shore from the leased area will conform will all standards established for such vessels, pursuant to the Ports and Waterways Safety Act of 1972 (46 U.S.C. 391a, as amended).

The following were considered in assessing the need for and adequacy of this stipulation:

An alternative considered encouraged offshore loading or pipelines, and set specifications for facilities. This alternative was designed for open-ocean OCS lease areas such as the northern Gulf of Alaska, Kodiak, and St. George where tanker operations provide safest operations and oilspills would be least damaging.

An option considered was designed for lease areas with essentially enclosed water bodies such as lower Cook Inlet and Shelikof Strait. This option requires pipelines, except for barging in emergency situations.

Still another option considered requires pipelining unless an alternative method of transportation would not pose additional risks to the environments.

Provisions of the OCS Lands Act, as amended, and regulations for development and production plans provide case by case analysis--public, State, and other agency input--CZM consistency, and NEPA review.

There are potential conflicts with multiple use concepts, and local Coastal Management Plans.

It would be less costly to ship directly from facilities at sea, than to transport to shore, process, and return to ships.

More than 80 percent of the world's crude production is carried to market by ship or barge and, following refining, more than 40 percent is again moved by water.

Tanker transport of produced hydrocarbons may only require offshore terminals and make use of existing marketing, ports, and distribution.

Impact of marine transport could be far less than construction of pipelines in Alaska. The environmental impacts from construction of subsea or overland pipelines can include destruction of vegetation, impact on marine life, wildlife, and people.

All exploration, development and production from offshore areas is subject to environmental safety assurance in response to regulations requiring Best Available and Safest Technology (BAST), and regulatory and CZM consistency review.

Evaluation of Effectiveness: The intent of this measure is to transport hydrocarbons by the safest and environmentally preferable method. The measure had been standard for most lease sales, but has not yet been implemented on the Alaska OCS since there has been no commercial discovery of oil or gas on the Alaska OCS. There was agreement to adopt this measure at the 2974 meeting held in Washington, D.C. on July 22, 1980.

The measure also recognizes and takes into account the Intergovernmental Planning Program (IPP) whose recommendations take into account local land use planning, coastal management, environmental data gaps, local socioeconomic conditions, transportation, routing and planning. This measure takes into account the vulnerable coastline surrounding lower Cook Inlet and Shelikof Strait. Although this stipulation requires pipelines, it allows the flexibility for alternative methods of transportation of hydrocarbons from the lease area as long as such modes of transportation do not pose additional unacceptable risks to the human, marine, and coastal environments. The stipulation in the lower Cook Inlet lease sale (sale CI) for transportation of hydrocarbons specifically reserves the right to determine the method of transportation of production to the lessor. Therefore, the proposed stipulation is consistent with the stipulation in Cook Inlet lease area (sale CI).

Potential Mitigating Measure No. 3 - Environmental Training Program:

Background: Uninformed workers and subcontractors could unknowingly destroy or damage the environment, or be insensitive to local historical or cultural values, as well as biological resources. Due to the importance of fisheries, subsistence, economics, and vessel operations in the Cook Inlet/Shelikof area, these aspects will be covered in the orientation program. These subjects have been identified in the scoping process as a major concern.

This stipulation has the potential to provide an increased measure of protection to the environment and addresses concerns of local residents. This program was implemented for the Trans-Alaska Pipeline and in the lower Cook Inlet OCS lease sale. The wording of this mitigating measure was used for the lower Cook Inlet sale, and the end product included excellent orientation programs. Therefore, it is resubmitted for consideration for the sale 60 area.

> Training Requirement Measure: The lessee shall include in any exploration and development plans submitted under 30 CFR 250.34 a proposed environmental training program for all personnel involved in exploration or development activities (including personnel of the lessee's contractors and subcontractors) for review and approval by the DCM (Deputy Conservation Manager, Field Operations, Alaska Region, USGS). The program shall be designed to inform each person working on the project of specific types of environmental, social, and cultural concerns which relate to the individual's job. The program shall be formulated by qualified instructors experienced in each pertinent field of study, and shall employ effective methods to ensure that personnel are informed of archeological, geological, and biological resources, to include bird and sea mammal rookeries, insuring avoidance and nonharassment of wildlife resources.
>
> The program shall also be designed to increase the sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which such personnel will be operating.
>
> The lessee shall also provide for review and approval a continuing technical environmental briefing program for supervisory and managerial personnel of the lessee and its agents, contractors, and subcontractors.

Slight word changes were discussed during 2974 meetings, but the overall intent was acceptable to the DOI agencies.

Evaluation of Effectiveness: This mitigating measure was chosen over a similar one used in the offshore area near Massachusetts. This measure was felt to be more applicable than the sale 42 (Georges Bank) measure which focusses on fisheries.

Although this measure provides no direct prohibitions of activities which may have cultural or social impacts on the area, it provides a positive mitigating effect by making workers aware of the unique environmental, social, and cultural values of the local residents and their environment. This orientation program will promote an understanding of and appreciation for local community values, customs, and lifestyles of Alaskans without creating undue economic costs to the lessee. There was agreement to adopt this measure at the 2974 meeting held in Washington, D.C. on July 22, 1980.

Potential Mitigating Measure No. 4 - Disposal of Muds, Cuttings, and Formation Waters:

Background: The following measure was accepted for OCS sale 42. The intent of this stipulation is to dispose of effluents in a manner which would not be detrimental to the commercial fisheries values. The measure may also provide environmental data.

> Effluent Disposal Measure: The DCM may require the lessee to dispose of drill cuttings and drilling muds, shunting the material to a depth and location below the ocean surface as specified by the DCM, or by transporting the material to disposal sites approved by the Environmental Protection Agency. The DCM shall determine the method of disposal based upon review of the data obtained from the surveys and studies established pursuant to the Stipulation for Protection of Biological Resources and from other relevant sources of information.
>
> Based upon the composition of produced formation waters, the site-specific environmental conditions in the leasing area, and the data obtained from the surveys and studies established pursuant to the Stipulation for Protection of Biological Resources, as well as data from other relevant sources, the DCM may require the lessee to reinject formation waters. The DCM shall provide written notice to the lessee of a decision to require reinjection of such formation waters.

The following was considered in assessing the need and adequacy of this stipulation for the lease area:

> The EPA has statutory authority (PL 92-500, the Clean Water Act and Amendments of 1977, Section 403) to permit the discharge of any pollutant into the territorial seas. The USGS supports this regulatory procedure in OCS Order No. 7. The lessee is required to submit a copy of the EPA Discharge Permit to the DCM and obtain the DCM's approval for the method of muds, cuttings, and produced water disposal.

Standard discharge rates and levels for effluents have been established in the lower Cook Inlet lease area by EPA in agreement with Department of the Interior agencies.

Through Coastal Zone Management Consistency Review, and other regulatory review procedures, Federal and State agencies are given the opportunity to comment on and recommend changes to proposed disposal techniques. An Environmental Assessment (EA) or Impact Statement is prepared for each proposed drilling program, identifying pollutant discharge techniques. The EA is also available for review by Federal, State, and local agencies.

The DCM may require at the request of a reviewing agency, that the operator change his proposed discharge plan prior to approval of any drilling activity. The DCM may approve the plan with conditional requirements, which prohibit a discharge practice.

Evaluation of Effectiveness: This measure may provide environmental information on the effects of muds, cuttings, and formation waters on the marine environment. The proposed stipulation does not define a specific disposal method, but rather defines alternatives for pollutant disposal which are already available to the DCM. Other regulations currently in existence as described above seem to preclude the need for a special stipulation. Therefore, it was decided through the field 2974 process that no special stipulation is required. At the Washington, D.C. 2974 meeting, held on July 22, 1980, there was formal agreement not to adopt this stipulation.

Potential Mitigating Measure No. 5 - Protection of Biological Resources:

Background: Variants of this measure have been accepted in various OCS areas. It provides a mechanism for defining important biological populations and the effects drilling operations may have on the biota. The measure may fill some data gaps and thereby assist the DCM in making specific recommendations on the location of a drilling vessel.

Biological Protection Measure: If the DCM, having reason to believe that biological populations or habitats requiring additional protection may exist within the lease area, gives the lessee written notice that the lessor is invoking the provisions of this stipulation, the lessee shall, upon receipt of such notice, comply with the following requirements:

Prior to the commencement of any drilling activity or construction or placement of any structure for exploration or development activity, the lessee shall conduct site-specific environmental surveys or studies, including sampling as approved by the DCM, to characterize existing environmental conditions in an indentified zone prior to oil and gas operations, and to determine the extent and composition of biological populations or habitats, and the effects of proposed existing operations on the populations or habitats which might require additional protective measures. The nature and extent of any such surveys or studies will be determined by the DCM on a case-by-case basis.

Based on any surveys or studies which the DCM may require of the lessee, the DCM may require the lessee to: 1) relocate the site of operations so as not to affect adversely the significant biological populations or habitats deserving protection; 2) modify operations in such a way as not to affect adversely the significant biological populations or habitats deserving protection; or 3) establish to the satisfaction of the DCM that such operations will not adversely affect the significant biological populations or habitats deserving protection. Based on any surveys or studies which the Supervisor may also require of the lessee, the DCM may require the lessee to provide for periodic sampling of environmental conditions during operations.

The lessee shall submit all data obtained in the course of such surveys or studies to the DCM, with the locational information for drilling or other activity. The lessee may take no action that might result in any effect on the biological populations or habitats surveyed, until the DCM provides written directions to the lessee with regard to permissible actions.

In the event that important biological populations or habitats are identified subsequent to commencement of operations, the lessee shall make every reasonable effort to preserve and protect all biological populations and habitats within the lease area, until the DCM provides written instructions to the lessee with regard to the biological populations or habitats identified.

Evaluation of Effectiveness: Biological surveys in connection with lease requirements and COST wells in the Gulf of Alaska, lower Cook Inlet, Kodiak, St. George Basin, and Norton Sound have not discovered any significant, new, or unexpected biological information which required any well relocations or changes in normal operating procedures.

Some wording changes, as reflected above, were agreed upon by the field 2974 group. An option to the measure is to change the wording to "the DCM may require" a survey. Exploration plans are reviewed by various agencies who could recommend a survey be put forth. Surveys could be enforced during production and development and during exploration studies. For example, the BLM funded OCSEA Program (sec. III.G.) had shown in the past (Beaufort Sea lease area) specific areas of biological sensitivity. These particular areas could then be surveyed through stipulation. Shelikof Strait may be an area of particular concern. There was agreement to adopt this measure at the 2974 meeting held in Washington, D.C. on July 22, 1980.

d. Possible Information to Lessees: Information to lessees provides notice to operators of special concerns in or near a lease area. The following were considered and accepted.

Information on Bird and Mammal Protection: Bidders are advised that during the conduct of all activities related to leases issued as a result of this lease sale, the lessee and its agents, contractors and subcontractors will be subject to the provisions of the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, as amended, and International Treaties.

Behavioral disturbance of most birds and mammals found in or near the sale 60 area would be unlikely if ocean vessels and aircraft maintained at least a 1-mile distance from wildlife concentration areas such as bird colonies or marine mammal rookeries. However, it is impossible to accurately predict effects of all potential disturbing factors on such species at any specific distance. Therefore, in the event that activities may disturb protected wildlife at distances other than 1-mile, the lessee or his contractors should be aware that such disturbance could be determined to constitute harassment, and thereby be in violation of existing Federal laws (e.g., the Marine Mammal Protection Act of 1972, Endangered Species act of 1973). Lessee is advised that all violations may be reported to the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, as appropriate, for disposition. Human safety will take precedence at all times over distances recommended herein for avoidance of disturbance of wildlife.

Due to the high density of birds and marine mammals which may be located in colonies and/or rookeries within or near the sale 60 area, restriction of aircraft and vessel traffic could reduce the potential for disturbance of such species.

Disturbance of birds and mammals could constitute violation of existing laws enforced by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

Evaluation of Effectiveness: Harassment of wildlife by aircraft violates State Fish and Game regulations. Disturbances are subject to regulation by Fish and Wildlife agencies (NMFS, F&WS, and the Alaska Department of Fish and Game). This information can also be distributed to private and commercial pilots throughout the State to protect wildlife from not only lease-related activities but also noise disturbances from other sources. For further protection, through negotiations between BLM and FAA, it was agreed that BLM will furnish FAA with a list of major seabird colonies and marine mammal rookeries. FAA agreed they would disseminate this information to pilots through their Notice to Airmen and annotate such areas on their Alaska Supplement Charts. There was agreement to adopt this measure at the 2974 meeting held in Washington, D.C. on July 22, 1980.

Information Concerning Fairways: Some of the tracts offered for lease may fall in areas which may be included in fairways, precautionary zones or traffic separation schemes. At the field 2974 meetings, a consensus was reached on the following wording:

> "Some of the tracts offered for lease may fall in areas which may be included in fairways, precautionary zones, or traffic separation schemes. Bidders are advised that the United States reserves the right to designate necessary fairways through some leased tracts pursuant to the Ports and Waterways Safety Act (33 U.S.C. 1223(c)), as amended."

Other options were discussed such as:

> "Recognizing the paramount right of navigation over all competing uses of high seas and the approaches to the United States, the United States hereby reserves the right to designate necessary fairways through these leased tracts pursuant to the Ports and Waterways Safety Act, Section 4(C) 33 U.S.C. 1223(c), as amended."

This wording was suggested by the Coast Guard. However, Interior agencies, in post sale notices, expressed concern over the statement regarding paramount right of navigation.

After consultation with the Coast Guard, it was determined that the Interior agreed-upon wording would adequately address notification to potential bidders regarding marine traffic routes in the lease area, and satisfy concerns of the Coast Guard reserving the right to designate fairways anytime. There was agreement to adopt this measure at the 2974 meeting held in Washington, D.C. on July 22, 1980.

e. Federal Grant Assistance: In addition to the protection of the human and ecological environment through the applicaton of the previously described USGS OCS operating orders, mitigating measures in place, and other potential sale-specific mitigating measures, the following discussion is offered to inform the affected communities of additional Federal assistance which may be available and which, if available, can act as a mitigation of sale impacts.

There are additional mitigating measures available to the Kenai Peninsula Borough and the Kodiak Island Borough. These take the form of planning assistance, because both the boroughs have planning and zoning capabilities as outlined in AS 29. Planning and zoning capabilities are by themselves mitigating measures.

Four Federal grant programs have had, and do have, funding available for land use planning. The first of these is Special Economic Development and Adjustment Assistance Program (known as title IX) of the Economic Development Administration. A title IX study was done by Kramer, Chin and Mayo, Inc. in 1978, but present assumptions and scenarios are different in many cases. There is funding available for comprehensive community planning under the Department of Housing and Urban Development's 701 program. Funds from this program have not been used in recent years in Kodiak, but they have received other HUD moneys such as block grants.

There are two grant programs under the Coastal Zone Management Act. The first under section 306 gives coastal States funds to plan for the allocation of land and water resources in their respective coastal zones. In Alaska, funding is available to organized coastal communities via the State to undertake this kind of planning. Section 308 provides for coastal energy impact program funding, available in the forms of grants, loans, and bond guarantees to 1) provide up-front public services and facilities necessitated by energy development, and 2) mitigate the loss of environmental and recreational resources. As previously stated, the borough has used 308 funding and will apply for a 306 grant.

There are other assistance programs available for airports, roads, ports, and harbors, water systems, sewage treatment plants, etc., on an individual basis.

f. Summary of Probable Impacts: The following discussion does not assume the other potential sale-specific mitigating measures or possible information to lessees (secs. II.B.2.c. and -d.) as part of the proposal. If those measures were adopted, it is expected that some impacts described in this DEIS would be reduced. The following impacts are more completely assessed in section IV. Within a 10-day transport period, oilspills have a 94 percent chance of impacting coastal habitats due to the

expanse of relatively close shoreline surrounding the lease sale area. Although species would be variously affected, intertidal dwelling species, such as razor clams, could be destroyed outright or tainted for a period of up to 1 year. Marine and coastal birds and their habitats could be severely impacted by an oilspill event, especially in the Shelikof Strait area. Major impacts (25-75% mortality of a bird species population) from spill incidents could occur in locations such as the Barren Islands, Shelikof Strait, Kupreanof Strait, and Whale Passage. Some vulnerable bird species indicated in the impact discussion could take as long as 50 years to recover from a single 50 percent mortality event.

Groundfish, halibut, and other populations of demersal fish species may be reduced by the effects of oilspills to some unquantifiable amount during the life of the proposal in the Shelikof Strait area. This is especially true of halibut, a species widely distributed within the strait and whose larvae are subject to pollution risk for 6 months of the year. Salmon generally are the most vulnerable of the commercial species to pollution events due to their dependence on inshore areas. Among these, pink salmon populations are more susceptible to the effects of pollution. A pollution event could adversely affect, in unquantifiable terms, a year class or more of fry, as well as a year class or more of adults.

Pink salmon populations that use the streams on the west side of Kodiak Island, particularly between Uganik Bay and Malina Bay, and those that spawn in Kamishak Bay, would be more adversely affected from an oilspill event than elsewhere in the area. Salmon using western Kodiak streams could lose entire year classes, an effect that could last for 5 years or more.

The Uganik Bay to Malina Bay area of Kodiak Island and other sections of the Shelikof Strait pose high risk from a pollution event to crab, shrimp, and other shellfish. Impacts to such species are expected to be local, but for a long duration. The egg and larval forms of crab species are most susceptible to the effects of pollution events, although the cumulative effects of increased oil and gas production and transportation could directly affect adult crab populations to an unknown extent through contamination or reduction of food sources. This could also be true of shrimp and other shellfish, especially in the Shelikof Strait area. Shrimp populations would be at high risk on the west side of Kodiak Island and in the larval drift area off Kachemak Bay. Intertidal organisms, such as razor clams, could have productivity delayed for 10 years or more, depending on the damage to the habitat from oiling.

The proposed sale would have little or no affect on the Kodiak, Homer, Port Lions, Seldovia, and Kenai commercial fisheries as a whole. Fisheries impacts that may occur from chronic and catastrophic oilspill events are expected to be localized. Multiple-use conflicts between oil and gas activity and commercial fishing should be localized, of relatively short duration, and subject to remedial action.

Sea otter populations are likely to sustain substantial direct mortality as a result of oilspills, particularly the relatively dense populations of the northern Kodiak Archipelago. Harbor seals, particularly those of Kamishak Bay and the Shuyak-Afognak Islands, are likely to be subjected to indirect effects through reduced habitat quality and/or food resources, but would be less likely than sea otters to sustain direct mortality. Major sea lion concentrations of the Barren Islands and Shelikof Strait are likely to sustain indirect

and possibly direct effects from oilspill incidents. The siting of tanker facilities on eastern Kodiak Island would increase risk of localized effects on marine mammals of the Marmot Bay area and to marine mammal habitats of Portlock Bank, a major feeding area for sea lions and fur seals.

It is possible that gray, fin, humpback, and possibly sei whales, which frequent nearshore habitats of the northern Kodiak Archipelago and Shelikof Strait, would be affected directly or indirectly due to the high risk of oilspills in these areas. Construction of tanker facilities on eastern Kodiak Island may lead to localized disturbance of cetaceans; and, as a result of tanker traffic, could expose important offshore feeding areas, such as Portlock Bank, to spill risk.

These feeding areas are probably more important to whales than those in lower Cook Inlet or Shelikof Strait.

The impacts from oil and gas production and transfer activities on primary and secondary species (and associated habitat) harvested for subsistence purposes within village subsistence-use areas cannot be quantified at this time, but are assessed at a high probability of risk from oilspill incidents. The proposal would subject the subsistence of the Kodiak Island villages along Shelikof Strait to a higher potential risk from an oilspill than for those villages elsewhere in the lease sale area. But, the cumulative effects of the proposal in relation to other oil and gas activities in the vicinity places the subsistence for the villages of English Bay and Port Graham at a risk approximating those of Kodiak Island villages. Port Lions and Ouzinkie would be additionally subject to the effects, undeterminable at this time, of chronic discharges and tankering incidents resulting from the oil terminal facility at Talnik Point. The same may be true of Homer near the Anchor Point environs terminal facility. The direct and indirect consequences at the village level of a major oilspill incident damaging locally-used subsistence resources and/or habitats could include restricted local hunting or fishing, for a duration consistent with the damage incurred; social and cultural stress associated with the shortage of customary and traditional resources in the places they are usually found; increased cost in time and money to replace lost resources, assuming local transportation means were suitable for using an extended harvest range; and problems of food distribution and local storage should crisis-oriented replacement programs be initiated.

Sociocultural systems impacts could be expected in the communities of Kodiak, Port Lions, and Homer with differing effects. The potential for confrontation would exist in Kodiak basically between fisheries-oriented residents and newer oil-related residents, which could be intensified by a significant oilspill incident, causing increased social conflict and disorder. Impacts of a major oil terminal facility on sociocultural systems of Port Lions also would be significant, centering on the effects of competition for scarce community goods and services; but, these effects are expected to be interpreted primarily as benefits rather than costs to the community. In Homer, the potential for major oil and gas onshore facilities nearby would likely increase debate over the direction of community growth and character and add fuel to the controversy experienced earlier in Homer over lease sale CI.

A major population, employment, and economic stimulus impact on the local economy of Port Lions could be anticipated if an oil storage and tanker terminal facility were sited there. Being a small community with an expected slow

(3%) annual rate of growth, the operations of an oil terminal facility and related functions could almost double the number of jobs available over the next two decades. The Homer area also would be expected to be impacted by an oil terminal site in the vicinity of Anchor Point, but to a lesser extent. A larger community, with access to the Anchorage labor pool to reduce disruptive secondary effects from local hiring, Homer is expected to be impacted less from OCS activities than from other sources of economic stimulus, which are expected to produce an employment growth rate of 5.2 percent annually during the next decade. This rate of growth in employment would increase to 6.5 percent with the lease sale. Elsewhere, the lease sale would be expected to produce only marginal increments in employment growth in the Kenai, Kodiak, and Anchorage areas and little or no economic stimulus to the villages on the Kenai Peninsula or Kodiak Island.

Significant impacts could be expected to all modes of transportation serving Port Lions under this alternative. A major expansion of the Port Lions airfield, possibly including extension of the runway into Kizhuyak Bay, would be required for the facility to function as a forward air support base to OCS operations in Shelikof Strait. Air traffic volume would increase dramatically, especially during the development phase, as would ground traffic in and around Port Lions. An additional 21 kilometers (15 mi) of roadway would be required to connect the airfield with the oil storage and marine tanker terminal at Talnik Point, as well as to service the onshore pipeline system. The operations at Talnik Point would produce the primary marine transportation impacts, in the short run, through summer barge traffic of rock and construction materials to the site. This would temporarily interfere with fishing in Kizhuyak Bay. The impact of tanker traffic (approximately 5 vessels per month) to and from the Talnik Point facility could produce the long-term impact of closing nearby fishing grounds over the life of the facility. The navigational uncertainties of Whale Passage suggest it would be unlikely that a marine service and supply base would be constructed at Port Lions, thus reducing the potential impact there.

The cumulative effects which could result from the proposed action and other major projects (sec. IV.A.1.h.) would be similar to, but more extensive than the impacts which have been described above.

2. Alternative II - No Sale

a. Description of the Alternative: This alternative is one which removes the total proposed lease area from consideration for lease.

b. Summary of Probable Impacts: To eliminate the proposed sale may reduce future OCS oil and gas production, require escalated imports of oil and gas, and create the national need to develop alternative energy sources to reduce the impacts from the cancellation of the sale (table II.B.2.b.-1).

Recent surpluses of high sulpher, low gravity Alaskan crude oil in southern California are short-term until permanent transportation systems are in place to move the crude to inland markets or until the system adjusts fully to shipping the crude to the Gulf of Mexico coast. The oil and gas that could become available from the proposal over the next 25-year period could add to national domestic production. If this proposal is cancelled, an additive impact of greater oil and gas deficits resulting in increased imports can be expected (table II.B.2.b.-1). If sales such as this are cancelled, the energy

Table II.B.2.b.-1
Energy Needed from Other Sources to Replace Anticipated
Oil and Gas Production from Proposed OCS Sale 60
(Mean Level of Resources if Resources are Found)

Total Crude Oil Production (bbls)	6.70×10^6
Total Natural Gas Production (cf)	1.173×10^{12}
Crude Oil BTU Equivalent @ 5.6×10^6 BTU/bbl (BTU)	3752×10^{12}
Natural Gas Equivalent @ 1021 BTU/cu.ft. (BTU)	1197.633×10^{12}
Total Oil and Gas Equivalent (BTU) (T O&G ÷ 5.6)	4949.633×10^{12}
Alternative Energy Sources	
Import Equivalents	
Oil Import Equivalents (bbls) 5.6×10^6	$.883863 \times 10^9$
Gas Import Equivalents (cu.ft.) Tot. O&G ÷ 1021	4.8478×10^{12}
Coal[a/] Import Equivalents (tons) Tot. O&G ÷ 24×10^6	206.2347×10^6
Coal for Gasification (tons)	2.0618×10^8
Coal Gasification[b/], Low BTU Number of Plants	1.32
Oil Shale[c/] (Tons)	1.262×10^9
Nuclear Capacity[d/] Number of Light H_2O Reactors with 1000 MW(e) capacity	3.764
First Core Fuel U_3O_8[e/] (Tons)	112.933
Annual Reload	37.64

a/ 1 Ton = 24×10^6 BTU hence $4949.633 \times 10^{12} \div 24 \times 10^6 = 206.2347 \times 10^6$

b/ Assuming Koppers-Totzek processing requiring 10,570 tons/day of coal for an output of 250×10^9 BTU's/day. Also assumes coal of 8,780 BTU's per pound.

Note: The above, and following conversion ratios were developed from sale BF December 1979, for this application:

e.g. Where $\frac{1.56}{5.86 \times 10}15$ is to $\frac{Z}{4.949 \times 10}15$ Z = 1.21748. Rounded to 1.32

c/ Assuming high grade shale recovery of 0.7 barrels per ton of oil shale.

d/ One kilowatt-hour equals 3,421 BTU at a theoretical conversion rate of other energy forms to electricity at 100 percent efficiency. Capacity is calculated assuming an 80 percent plant factor and 33 percent efficiency of fossil fuel electricity generation.

e/ Assuming 30 metric tons enriched U_3O_8 first core fuels, and 10 metric tons enriched U_3O_8 annual reloads with plutonium recycle for each normalized 1,000 MW(e) light water reactor.

actions or sources shown in the table might be used as substitutes. Based upon the range of undiscovered resources estimated by the USGS for the proposed sale area, table II.B.2.b.-1 presents the energy equivalents which would be required for other energy sources to substitute for this proposed action.

The Department of the Interior's FEIS for OCS lease sale 48 (sec. VIII.D.) contains a discussion of trends in alternative energy sources.

The future U.S. energy source mix will depend on a multiplicity of factors, among them the identification of resources, research and development efforts, development of technology, rate of economic growth, the economic climate, changes in lifestyle and priorities, capital investment decison, energy prices, world oil prices, environmental quality priorities, government policies, and availability of imports. Table II.B.2.b.-1 shows the amount of energy from other souces needed to replace anticipated mean level resources from proposed sale 60.

The acceptability of oil and gas imports as an alternative is diminished by:

The security risks inherent in placing reliance for essential energy supplies on sources which have demonstrated themselves to be politically unstable and prone to use interruption of petroleum supplies to exert economic and political pressure on their customers.

The aggravation of unfavorable international trade and payments balances which would accompany substantial increases in oil and gas imports.

Apparent high costs of liquefying and transporting natural gas other than overland by pipeline.

The future local ecological and socioeconomic environment would be unaffected by the no sale case. Except to the national economy, the environmental impacts of the no sale case would be insignificant.

3. Alternative III - Delay the Sale:

a. Description of the Alternative: This alternative would delay the implementation of the proposal as previously described in section II.B.1.a. for a 2-year period. The impacts associated with this option are not necessarily avoided, but are delayed and may be reduced to some extent by future changes that might occur to increase the environmental controls applied to this action. The nature and extent of such controls are unknown.

b. Summary of Probable Impacts: The impacts of the delay of sale alternative are similar to those for the proposal, delayed but not avoided. For a few impacts, however, the delay makes a difference in degree of severity. Potential impacts on Port Lions could be reduced if the city used the time to study and prepare strategies/plans in the specific context of existing community facilities, services, expectations, and limitations to accommodate major population and oil facility impacts. Additional time would also provide the opportunity to fill biological data gaps, existing especially in the Shelikof Strait area, for finfish and shellfish populations, marine mammals and cetaceans, marine and coastal birds, and vulnerable coastal habitats. The need for such data has biological as well as social significance to the renewable

resource sector of the Island economy and to localized, subsistence-oriented village economies. Especially for the Shelikof Strait subsistence-use villages, delaying the sale would allow time for localized biological studies to be carried out on primary and alternate (secondary) subsistence species used by village residents. Such studies would be useful for assessing the biological impact of oilspill incidents on discrete ecosystems and for pollution contingency planning to lower the risk to village subsistence resources.

The cumulative effects which could result from the proposed action and other major projects (sec. IV.A.1.h.) would be similar to, but more extensive than the impacts which have been described above.

4. Alternative IV: Modification of the proposed sale area by deletion of 19 blocks within the Cook Inlet and 66 blocks within the Shelikof Strait (total deletion of 85 blocks).

a. Description of the Alternative: This alternative involves the leasing of 68 blocks within the lower Cook Inlet and the northern portion of the Shelikof Strait (fig. II.B.4.a.-1). The blocks proposed for leasing under this alternative comprise an area of about 154484 hectares (381,443 acres). The blocks are located approximately 11 to 37 kilometers (7 to 23 mi) offshore in water depths of 35 to 187 meters (115 to 613 ft). See appendix J within this EIS for block size, distance from shore, and water depth.

According to known geophysical data, the Geological Survey, based on unrisked statistical estimates, projects the 68 blocks offered in this alternative have a 5 percent chance of containing commercial resources amounting to 260 MMbbls of oil and 456 Bcf of natural gas. The deletion of the blocks required by this alternative would result in reducing the estimated recoverable resources by some 410 MMbbls of oil and 717 Bcf of gas below those of the proposal.

Exploration is hypothesized to begin in 1982 and continue through 1985 with a total of 10 exploration and delineation wells drilled. No more than two rigs will be assumed to be in operation during any year of the exploratory period. Jack-up rigs could be used in areas where water depths are less than 61 meters (200 ft). Semisubmersibles could be used in areas of deeper water.

Primary maritime support and supply activities would occur from existing industry facilities at Kenai. Aircraft support would be conducted from airfield(s) on the Kenai Peninsula.

Pipeline construction would begin in 1984 and continue through 1986. There would be two pipeline systems totaling about 402 kilometers (250 mi). Of that length, 290 kilometers (180 mi) would be offshore pipeline, split evenly between an oil and a gas pipeline system. Both pipelines would landfall at a site located between Anchor Point and Stariski Creek on the Kenai Peninsula.

The oil would be processed at a terminal at this site; the gas would continue 113 kilometers (70 mi) by overland pipeline to Nikiski. There the gas would be liquefied at an existing LNG facility and transported to market.

Pipeline diameters assumed for this alternative are 18 inches for oil and 10 inches for gas. All offshore pipe would be emplaced by either a lay or reel barge. Standard pipe lay barges can operate in wave heights up to 1.5 meters

FIGURE II. B. 4. a. – 1

LOWER COOK INLET-SHELIKOF STRAIT
PROPOSED OCS SALE NO. 60

ALTERNATIVE IV

COMPOSITE PROTRACTION DIAGRAM
OF AREA SELECTED

AREA OF CALL

TRACTS LEASED IN SALE NO. CI

BLOCKS CONSIDERED FOR ALTERNATIVE IV

OIL TERMINAL (Hypothetical)

GAS TERMINAL (Hypothetical)

NIKISKI

COOK INLET

KENAI PENINSULA

ANCHOR POINT

KACHEMAK BAY

KAMISHAK BAY

CAPE DOUGLAS

BARREN ISLANDS

ALASKA PENINSULA

AFOGNAK ISLAND

SHELIKOF STRAIT

TALNIK POINT

GULF OF ALASKA

CHINIAK BAY

KODIAK ISLAND

CAPE CHINIAK

CAPE IKOLIK

Source: Alaska Outer Continental Shelf Office 1980

(5 ft). As the weather throughout the proposed sale area is generally inclement, it is probable that larger lay barges, such as the "Viking Piper," would be used in order to minimize downtime.

Oil and gas production would begin in 1987. By that year, two pile-supported steel tower production platforms would be installed. By 1989, some 76 production and service wells would be drilled. Both oil and gas production would cease in 2009. The estimated life of this field is 22 years.

A summary of activities required to develop the estimated reserves of this alternative is on table II.B.4.a.-1. Note the frame of reference as described in section II.A.

b. Summary of Probable Impacts: The deletion of a significant number of tracts in Shelikof Strait by alternative IV, and the elimination of offshore air support and oil terminal facilities from the Kodiak Archipelago, significantly reduces the potential impacts to this area by an undeterminable extent, especially to the subsistence villages, as compared with the proposal, with some exceptions. Marine mammals, cetaceans, and bird populations that use the lower Cook Inlet and Barren Islands areas are subject to essentially the same impacts and cumulative effects, principally from potential oilspill incidents, as in the proposal. Potential impacts from oilspills on marine mammals, birds, and coastal habitats would be reduced substantially in the Shelikof Strait and to sea otter, sea lion, harbor seal, and cetacean habitats in the northern Kodiak Archipelago. Risk to marine mammals from direct and indirect effects of pollution would remain high in this area, but would be much less than that of the proposal, particularly since no tanker facility or traffic would occur in the vicinity of eastern Kodiak Island or over Portlock Bank.

Impacts to the Kenai Peninsula/Cook Inlet area are the same as the proposal, with a few exceptions. Risk from oilspills to the subsistence use areas of English Bay and Port Graham would likely be significantly reduced. The degree of impact reduction cannot be determined at this time. Risk to the subsistence use areas of these villages would be increased, but would be less than those attributed to the proposal, when the cumulative effects of sale CI and oil tankering are considered. Tanker traffic would likely be two-thirds of the proposal.

The cumulative effects which could result from the proposed action and other major projects (sec. IV.A.1.h.) would be similar to, but more extensive than the impacts which have been described above.

5. Alternative V: Modification of the proposed sale area by the deletion of 19 blocks in Cook Inlet and 81 blocks in Shelikof Strait (total deletion of 100 blocks).

a. Description of the Alternative: This alternative involves the leasing of 53 blocks located entirely within the lower Cook Inlet (fig. II.B.5.a.-1). The blocks proposed for leasing under this alternative comprise an area of about 126816 hectares (313,125 acres). The blocks are located approximately 11 to 37 kilometers (7 to 23 mi) offshore in water depths of 35 to 150 meters (115 to 492 ft). See appendix J for block size, distance from shore, and water depth.

Table II.B.4.a.-1
Summary of Activities Required to Develop the
Estimated Resources Within
Alternative IV

---

1. Estimated acreage, construction activity and resources:
   a. Sale Acreage Offering: 154484 hectares (381,443 acres)
   b. Exploration and Delineation Wells: 10
   c. Production Platforms: 2
   d. Production Wells: 76
   e. Workover Wells: 244
   f. Pipelines:

	Oil (18" diameter)	Gas (10" diameter)
Offshore length:	145-153 km (90-95 mi to Anchor Point)	145-153 km (90-95 mi to Anchor Point)
Onshore length:	0	113 km (70 mi to Nikiski)

   g. Terminal(s):

      Oil: 1 (Anchor Point)
      Gas: Use existing terminal at Nikiski.

   h. Recoverable Hydrocarbons:

	Oil	Gas
Total Production:	260.0 MMbbls	456.0 Bcf
Peak Production:	119.7 Mbbls/D	209.0 MMcf/D
Average Annual Production:	11.3 MMbbls	19.8 Bcf

2. Estimated peak annual transportation by tanker:
   Oil: 43.7 MMbbls
   LNG: 23 MMbbls

3. Estimated tonnage (2,000lbs/ton) of commercial muds and volume of drill cuttings (assuming 10 exploration wells at 4864 meters (16,000 ft) and 76 production wells at 3040 meters (10,000 ft):

Exploration/Production

	Exploratory Period		Production Period	
	Per Well	Total Field	Per Well	Total Field
Muds:	947 metric tons (1,044 tons)	9,470 metric tons (10,440 tons)	680 metric tons (750 tons)	6,392 metric tons (7,031 tons)
Cuttings:	$539m^3$ ($704\ yd^3$)	$5390m^3$ ($7,040\ yd^3$)	$206m^3$ ($269\ yd^3$)	$15,656m^3$ ($20,444\ yd^3$)

* Please note that during the production and development period drill mud is reused. Approximately 10 percent of the total drill mud used is lost downhole.

4. Estimated volume of formation water produced:
A prediction cannot be made at this time due to incomplete knowledge of the subsurface geology of the Shelikof Strait. However, based upon the behavior of the upper Cook Inlet field we may hypothesize that at midlife the sale 60 field will be producing one barrel of formation water for every two barrels of oil or approximately 5 MMbbls per year.

5. Estimated land use requirements for onshore facilities:

Support/Supply: Existing facilities will suffice.

	Oil	Gas
Terminal(s) and related facilities:	1 terminal (31 hectares/76 acres)	0

6. Estimate burial disturbance of offshore pipeline (assuming 2377 m^3/km (5,000 yd^3/mi) for oil pipeline and 1902 m^3/km (4,000 yd^3/mi) for gas pipeline):

Oil: 344665-363681 m^3 (450,000-475,000 yd^3)

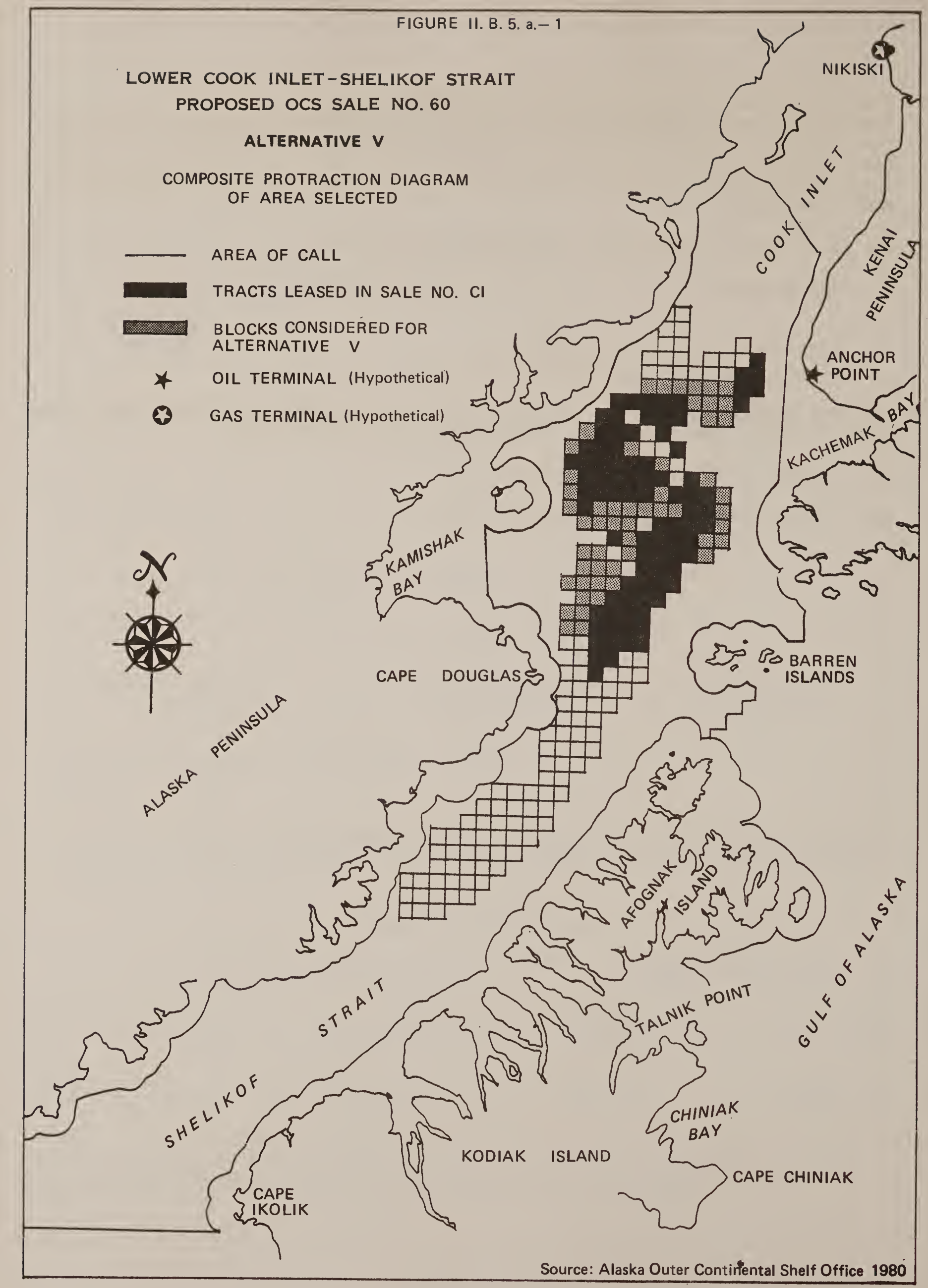
Gas: 275790-291006 m^3 (360,000-380,000 yd^3)

FIGURE II. B. 5. a.– 1

LOWER COOK INLET–SHELIKOF STRAIT
PROPOSED OCS SALE NO. 60

ALTERNATIVE V

COMPOSITE PROTRACTION DIAGRAM
OF AREA SELECTED



Source: Alaska Outer Continental Shelf Office 1980

Table II.B.5.a.-1
Summary of Activities Required to Develop the
Estimated Resources Within
Alternative V

---

1. Estimated acreage, construction activity and resources:
   a. Sale Acreage Offering: 126815 hectares (313,125 acres)
   b. Exploration and Delineation Wells: 6
   c. Production Platforms: 2
   d. Production Wells: 53
   e. Workover Wells: 168
   f. Pipelines:

	Oil (18" diameter)	Gas (10" diameter)
Offshore length:	129 km (80 mi to Anchor Point)	129 km (80 mi to Anchor Point)
Onshore length:	0	113 km (70 mi to Nikiski)

   g. Terminal(s):

      Oil: 1 (Anchor Point)
      Gas: Use existing terminal at Nikiski.

   h. Recoverable Hydrocarbons:

	Oil	Gas
Total Production:	180.0 MMbbls	316.0 Bcf
Peak Production:	89.9 Mbbls/D	157.5 MMcf/D
Average Annual Production:	8.2 MMbbls	14.4 Bcf

2. Estimated peak annual transportation by tanker:
   Oil: 32.8 MMbbls
   LNG: 17 MMbbls

3. Estimated tonnage (2,000 lbs/ton) of commercial muds and volume of drill cuttings (assuming 6 exploration wells at 4864 meters (16,000 ft) and 53 production wells at 3040 meters (10,000 ft):

Exploration/Production

	Exploratory Period		Production Period	
	Per Well	Total Field	Per Well	Total Field
Muds:	947 metric tons (1,044 tons)	5682 metric tons (6,624 tons)	680 metric tons (750 tons)	4828 metric tons (5,311 tons)
Cuttings:	$539m^3$ ($704\ yd^3$)	$3234m^3$ ($4,224\ yd^3$)	$206m^3$ ($269\ yd^3$)	$10918m^3$ ($14,257\ yd^3$)

* Please note that during the production and development period drill mud is reused. Approximately 10 percent of the total drill mud used is lost downhole.

4. Estimated volume of formation water produced:
A prediction cannot be made at this time due to incomplete knowledge of the subsurface geology of the Shelikof Strait. However, based upon the behavior of the upper Cook Inlet field we may hypothesize that at midlife the sale 60 will be producing one barrel of formation water for every two barrels of oil, or approximately 4 MMbbls per year.

5. Estimated land use requirements for onshore facilities:

Support/Supply: Existing facilities will suffice.

	Oil	Gas
Terminal(s) and related facilities:	1 terminal (23 hectares/59 acres)	0

6. Estimated burial disturbance of offshore pipeline (assuming 2377 m^3/km (5,000 yd^3/mi) for oil pipeline and 1902 m^3/km (4,000 yd^3/mi) for gas pipeline):

Oil: 306633 m^3 (400,000 yd^3)

Gas: 245358 m^3 (320,000 yd^3)

According to known geophysical data, Geological Survey, based on unrisked statistical estimates, projects the 53 blocks offered in this alternative have a 5 percent chance of containing commercial resources amounting to 180 MMbbls of oil and 316 Bcf of natural gas. The deletion of the blocks required by this alternative will result in reducing the estimated recoverable resources by some 490 MMbbls of oil and 867 Bcf of gas below those of the proposal.

Exploration is hypothesized to begin in 1982 and continue through 1985 with a total of six exploration and delineation wells drilled. No more than two drilling rigs would be assumed to be working during any year of the exploratory period. Jack-up rigs could be used in areas where water depths are less than 61 meters (200 ft). Semisubmersibles would be used in areas of deeper water.

Primary maritime support and supply activities would occur from existing industry facilities at Kenai. Aircraft support would be conducted from airfield(s) located on the Kenai Peninsula.

Pipeline construction would begin in 1985 and continue through 1986. There would be two pipeline systems totaling about 369 kilometers (230 mi). Of that length, 257 kilometers (160 mi) would be emplaced under water. The mileage would be split evenly between an oil and gas pipeline system. Both of these routes would terminate at an onshore terminal located between Anchor Point and Stariski Creek. The gas pipeline would continue overland 113 kilometers (70 mi) to Nikiski. There, the gas would be liquefied at a then existing LNG facility and transported to market.

Pipeline diameters assumed for this alternative are 18 inches for oil and 10 inches for gas. All offshore pipe would be emplaced by either a lay or reel barge. Standard pipe lay barges can operate in wave heights up to 1.5 meters (5 ft). As the weather throughout the proposed sale area is generally inclement, it is probable that larger lay barges, such as the "Viking Piper," would be used in order to minimize downtime.

Oil and gas production would begin in 1986. By that year, two pile-supported steel tower production platforms would be installed. By 1988, some 53 production and service wells would be drilled. Both oil and gas production would cease in 2008. The estimated life of this field is 22 years.

A summary of activities required to develop the estimated mean reserves of this alternative is on table II.B.5.a.-1. Note the frame of reference as described in section II.A.

b. Summary of Probable Impacts: The impacts which might occur with alternative V were not found to be significantly different from those in alternative IV, with the exception that alternative V provides an increased, but unquantifiable level of protection from potential oilspills to the Barren Islands (marine mammals, cetaceans, and birds) and the east side of Afognak Island (commercial fishing), and other areas of the northern Kodiak Archipelago. Risk from oilspill damage to subsistence resource areas would be somewhat less in Shelikof Strait and lower Cook Inlet, with potential cumulative effects on these resource areas also moderated by the alternative.

The cumulative effects which could result from the proposed action and other major projects (sec. IV.A.1.h.) would be similar to, but more extensive than the impacts which have been described above.

6. Alternative VI: Modification of the proposed sale area by the deletion of all blocks within the lower Cook Inlet (total deletion of 86 blocks).

a. Description of the Alternative: This alternative involves the leasing of 67 blocks located entirely within the Shelikof Strait (fig. II.B.6.a.-1). The blocks proposed for leasing under this alternative comprise an area of about 154080 hectares (380,630 acres). The blocks are located approximately 10 to 27 kilometers (6 to 16 mi) offshore in water depths of 119 to 219 meters (390 to 718 ft). See appendix J for block size, distance from shore, and water depth.

According to known geophysical data, Geological Survey, based on unrisked statistical estimates, projects that the 67 blocks offered in this proposal have an estimated 5 percent chance of containing commercial resources amounting to 335 MMbbls of oil and 586 Bcf of gas. The deletion of the blocks required by this alternative will result in reducing the estimated recoverable resources by one-half of the amount stated for the proposed action.

Exploration is hypothesized to begin in 1982 and continue through 1986 with a total of 11 exploration and delineation wells drilled. No more than two rigs would be assumed to be in operation during any year of the exploratory period.

Jack-up rigs could be used in areas where water depths are less than 61 meters (200 ft). Semisubmersibles could be used in areas of deeper water.

Primary maritime support and supply activities would occur from existing industry facilities at Kenai. Aircraft support would be conducted from airfield(s) at Port Lions and possibly at Cape Chiniak.

Pipeline construction would begin in 1985 and continue through 1986. A single 144 kilometers (90 mi) oil pipeline system would be constructed. Of the total pipeline length, some 128 kilometers (80 mi) would be constructed offshore with the final 16 kilometers (10 mi) emplaced on land.

Oil pipeline diameter assumed for this alternative would be 18 inches. The oil pipeline would service the entire Shelikof Strait. It would be constructed through the Kupreanof Straits to Chernof Point, and then overland to a tanker loading terminal constructed at Talnik Point. A Talnik Point facility would be exposed to northern weather and would require a protective breakwater. Oil tankers enroute to a Talnik Point facility would arrive from the Gulf of Alaska via Marmot Bay.

Standard pipe lay barges can operate in wave heights up to 1.5 meters (5 ft). As the weather throughout the proposed sale area is generally inclement, it is probable that larger lay barges, such as the "Viking Piper," would be used in order to minimize downtime.

All gas produced in this alternative would not be viewed as being economically recoverable and would be reinjected into the formation.

FIGURE II. B. 6. a.– 1

LOWER COOK INLET-SHELIKOF STRAIT
PROPOSED OCS SALE NO. 60

ALTERNATIVE VI

AREA OF CALL

TRACTS LEASED IN SALE NO. CI

BLOCKS CONSIDERED FOR ALTERNATIVE VI

OIL TERMINAL (Hypothetical)

NIKISKI
COOK INLET
KENAI PENINSULA
ANCHOR POINT
KACHEMAK BAY
KAMISHAK BAY
CAPE DOUGLAS
BARREN ISLANDS
ALASKA PENINSULA
AFOGNAK ISLAND
GULF OF ALASKA
SHELIKOF STRAIT
TALNIK POINT
CHINIAK BAY
KODIAK ISLAND
CAPE CHINIAK
CAPE IKOLIK

Source: Alaska Outer Continental Shelf Office 1980

The distance of a Shelikof gas field from existing hydrocarbon infrastructure and the cost of gas processing facilities and attendant pipelines would make it unlikely that the product would be brought to shore.

Oil and gas production could begin in 1987. By that year, two pile-supported steel tower production platforms could be installed. By 1989 some 96 production and service wells may be drilled. By 2006 oil production could cease, and by 2010 gas production could cease. The estimated life of this field is 23 years.

Alternative VI is the result of input which was received late in the scoping process. As a result, the scenario associated with this alternative did not receive the same level of detailed statistical analysis as was afforded alternatives I, IV, and V. However, the activities required to develop the resources of this alternative are very similar to that which is portrayed for the minimum case of the proposed action. The attention of the reader is therefore directed to the appropriate text and to the tables located in appendices A and B.

b. Summary of Probable Impacts

Deletion of tracts in lower Cook Inlet by alternative VI and the restriction of onshore oil facilities on Kodiak Island creates potential impacts to the Kodiak Archipelago and the Shelikof Strait area as in the proposal, with some exceptions. The location of onshore facilities on Kodiak Island could increase the impact from oilspill events over the proposal to vulnerable coastal habitats in Marmot Bay if the hydrocarbon find in Shelikof Strait were such to warrant placing the entire offshore support operation there. Potentially reduced, but unquantifiable impacts from the proposal could be expected to the subsistence resource use areas of Larsen Bay, Ouzinkie, and Port Lions. Although the impacts to renewable resources used in Marmot Bay may be impacted as in the proposal or as stated above. Fishermen that use the area from Uganik Bay to Malina Bay would have the potential of being adversely impacted from an oilspill event as in the proposal. Risk from oilspills would be reduced somewhat over the proposal to the marine mammal and bird habitats of the northern Kodiak Archipelago and Shelikof Strait, and would be reduced substantially in Kamishak Bay, Anchor Point, and other areas of lower Cook Inlet. The impact on sea lions, fur seals, and cetaceans that use Portlock Bank and nearshore marine habitats east of Kodiak Island could be as high as under the proposal from the cumulative effects of tankering out of Talnik Point.

The impacts on lower Cook Inlet and Kenai Peninsula communities by the alternative would be substantially reduced from the proposal, although the cumulative effects from sale CI and tankering movement in the area are such to maintain relatively high risk to commercial fishing, finfish and shellfish populations, coastal and marine birds, marine mammals, and subsistence resource use areas. There may be some reduction in cumulative impacts in the Polly Creek area of Cook Inlet (clams) and Kamishak Bay (crab fishing and beluga whale habitat), but the potential effects on beluga whales are unknown. The impacts on the transportation systems of Anchorage and the Kenai Peninsula would likely be substantially reduced, and there would probably be a reduced potential for community conflict in Homer.

The cumulative effects which could result from the proposed action and other major projects (sec. IV.A.1.b.) would be similar to, but more extensive than the impacts which have been described above.

C. Comparative Analysis of Impacts and Alternatives: This discussion deals with the most significant differences and similarities among impacts and alternatives in comparison with the proposed action, alternative I.

Alterative II (no sale) eliminates impacts within Alaska but may pose potentially adverse impacts on the national economy.

Alternative III (delay the sale) delays potential impacts of the proposal, but does not avoid them. A reduction in biological and social impacts by some unquantifiable degree could be achieved if the delay were used to strategically plan for community impacts on Port Lions and to fill biological data gaps for discrete ecosystems employed in subsistence-oriented village economies.

Alternative IV significantly reduces major potential impacts from the proposed action to Kodiak Island and the Shelikof Strait area through significant block deletion within Shelikof Strait and the use of expanded oil and gas processing facilities on the Kenai Peninsula. Biological impacts to certain marine mammals in the northern Kodiak Archipelago also are reduced substantially, whereas such impacts in the Barren Islands and lower Cook Inlet are as in the proposed action. Impacts to the subsistence resources of affected Kenai Peninsula villages are expected to be moderated by an unquantifiable extent through this alternative. However, the alternative contributes only an indeterminable incremental risk to lower Cook Inlet commercial, subsistence, and other biological resources that are subject to substantial potential impact from tankering pollution and existing oil and gas operations in Cook Inlet.

Alternative V, by means of deleting the entire Shelikof Strait area from leasing and following the same developmental scenario as alternative IV, significantly reduces major potential impacts from the proposal to Kodiak Island and the Shelikof Strait area and reduces, to an indeterminable extent, the potential impacts from oilspill incidents to biological resources inhabiting the Barren Islands and Afognak Island. The major potential impacts to lower Cook Inlet and the Kenai Peninsula are as found in alternative IV. Of all the alternatives, alternatives IV and V generally provide a greater reduction of potential impacts to biological resources, although risk from pollution incidents remains significant in all alternatives.

Alternative VI, the deletion of Cook Inlet tracts from leasing, predicates impacts on a developmental scenario which centers oil processing and transfer on Kodiak Island. Oil and gas operations offshore in Shelikof Strait and the introduction of a new sector to the economy of Kodiak Island, produces impacts the same as the proposal in this area, potentially greater impacts than the proposal in Marmot Bay, and substantially reduced impacts in the lower Cook Inlet area.

III. DESCRIPTION OF THE AFFECTED ENVIRONMENT

Portions of the following material describing the affected environment can be found on the back of an appropriate graphic as indicated below.

A. Physical Constraints on Oil and Gas Development

1. Geology: Refer to the back of graphics 1 through 4.

2. Meteorological Conditions and Oceanography: Refer to the back of graphics 1 through 4.

B. Description of the Biological Characteristics of the Affected Environment

1. Vulnerable Nearshore and Intertidal Habitats: Refer to the back of graphics 1 through 4.

2. Commercial and Sportfish: Refer to the back of graphics 5 through 8.

3. Marine and Coastal Birds: Refer to the back of graphics 9 through 12.

4. Marine Mammals: Refer to the back of graphics 9 through 12.

5. Terrestrial Mammals: Refer to the back of graphics 9 through 12.

6. Endangered Species: Refer to the back of graphics 9 through 12.

C. Description of Social and Economic Components of the Affected Environment

1. Social Factors: Refer to the back of graphics 13 through 16.

2. Economy:

a. State and Regional Economy: In the section below the current local economic situation in Kodiak is described to provide background for later sections describing significant possible impacts of sale 60 on the area. State, regional, and some non-Kodiak, non-Kenai local community background (Seward or Homer) is not presented because of the low impact of sale 60 on the areas. For this State, regional, and non-Kodiak, non-Kenai economic background information, see University of Alaska, Institute of Social and Economic Research (1978, 1980), and Alaska Consultants, Inc. (1979). The description of the local Kodiak economic area is taken from the second study.

b. Local Economy - 1, Kodiak Census Division: Kodiak's future growth and prosperity is inextricably tied to growth in this community's primary industry, fishing and fish processing. Other sources of economic strength include the continued presence of the U.S. Coast Guard in the area plus some probable expansion in tourism and recreation activities and in wood products. The investment plans of the regional and village corporations established under the terms of the Alaska Native Claims Settlement Act will also be a factor in the future growth of both Kodiak and other communities on the island.

Present fisheries activity in the Kodiak area centers around the exploitation and processing of king, tanner, and Dungeness crab, shrimp, salmon, and lesser amounts of other species. Employment in this sector of the area's economy has grown significantly during the past few years. In large part, this is due to the growth of the tanner crab fishery which has led to increased employment during the winter months and, thus, to gains in annual average employment. See sections III.C.2.b. and c. for more detail.

Continued growth in Kodiak's fishing and fish processing industry is anticipated. While some of this growth will come from the recovery and stabilization of catches in traditional fisheries, bottomfishing offers the greatest potential for major increases in employment and population in the Kodiak area. Some effort toward establishing a bottomfish industry in the Kodiak area has already been made. After the establishment of a 200-mile offshore territorial limit, American fishermen and processors became increasingly interested in exploiting bottomfish resources. Kodiak and/or the Aleutians (Dutch Harbor) may be the most logical locations for the establishment of a major bottomfish operation.

The Kodiak Coast Guard station is anticipated to remain at or around current strength in the future unless major new developments such as the exploitation of oil and gas resources in the Gulf of Alaska take place. The Coast Guard base recently increased its complement of personnel following the establishment of a 200-mile offshore U.S. territorial limit and no further expansion is foreseen except under new conditions such as that mentioned above.

The wood products industry is currently not significant in the Kodiak area. However, depending on the future status of Afognak Island, i.e., whether or not it is selectable by Native corporations established under the terms of the Alaska Native Claims Settlement Act, this industry could become a small but significant element in the economy of the Kodiak area.

Finally, the investment plans of the Native corporations based on Kodiak Island including Koniag, Inc., the regional corporation, and the various village corporations, promise to play an important role in the economic future of the Kodiak area. While the status of some of the village corporations is still subject to litigation, the island's Native residents will ultimately become its major private landowners and will control virtually all coastal lands outside the immediate Kodiak area which are not in Federal ownership. Given the marine orientation of all communities on Kodiak Island, the Native corporations will thus be in a good position to influence new economic development in this area, including the possible exploration and exploitation of outer continental shelf oil and gas resources of the western Gulf of Alaska.

Employment: As shown in table III.C.2.b.-1, by far the largest sector of the Kodiak division's nonagricultural wage and salary employment in 1976 was manufacturing, almost all of which was associated with seafood processing. This sector averaged 1,639 employees in 1976 and accounted for 36.5 percent of the division's total nonagricultural employment. A large proportion of fishermen are not included in state nonagricultural wage and salary statistics. However, it is assumed that essentially all 406 jobs (or 9% of the total) recorded in the miscellaneous sector in 1976 were held by fishermen. Virtually all jobs in fishing and fish processing in the Kodiak area can be considered basic, as only very minor amounts of fish are produced for local consumption.

Table III.C.2.b.-1
Nonagricultural Wage and Salary Employment Distribution
Kodiak Labor Area
1970-1976

	1976		1970 - 1976
	Number	Percent	% Change
Mining	0		
Contract Construction	253	5.6	450.0
Manufacturing	1639	36.5	120.6
Transportation, Communications, and Public Facilities	213	4.7	- 1.8
Trade	512	11.4	4.0
Finance, Insurance, and Real Estate	105	2.3	
Service	406	9.0	113.7
Miscellaneous	428	9.5	95.4
Government	894	19.9	6.7
Federal	(278)	6.2	(-28.2)
State and Local	(616)	(13.7)	(36.6)
TOTAL	4487	100.0	68.6

Source: Alaska Consultants, Inc., 1979. Table 84, p. 406.

After manufacturing, government was the largest employment sector in the Kodiak division in 1976. State and local government employment, as recorded by the Alaska Department of Labor, was the major subsector with most of this employment assumed to be in local government. The largest single local government employer is the Kodiak Island Borough School District. However, Federal Government employment is also a very significant element in Kodiak's economy. The largest Federal employer is the U.S. Coast Guard station which reported 175 civilian employees in 1978. Not included in State statistics, however, are 1,000 service personnel (and their families) stationed in the community. All Coast Guard personnel, both civilian and military, can be considered basic employees. A share of state and other Federal employment in the Kodiak Island area can also be considered basic.

Of the remaining sectors of the Kodiak division's economy in 1976, the trade and service sectors were the most heavily represented. Kodiak has well developed trade and service sectors, with a portion of this employment judged to be basic since it is derived from providing goods and services to the transient fishing fleet and processing plant workers. The division had an annual average of 512 employees in trade and 406 in services in 1976, accounting for 11.4 and 9.0 percent, respectively, of total nonagricultural wage and salary employment.

Contract construction averaged 253 employees in the Kodiak division in 1976. A large share of these employees were probably basic as the Coast Guard station saw a good deal of construction activity after the takeover of this facility from the Navy in 1972. Other major construction projects in the Kodiak division in 1976 are unknown but presumably at least some were also associated with basic activities.

The transportation, communications, and public utilities sectors averaged 213 employees in the Kodiak division in 1976 and accounted for 4.7 percent of total nonagricultural wage and salary employment. Most employees are probably secondary.

Kodiak functions as a redistribution point for waterborne freight destined for the Prince William Sound area and the Aleutians. The island is also served by several airline and air taxi operators. Employees are primarily basic.

Finance, insurance, and real estate averaged 105 employees in 1976, or 2.3 percent of the Kodiak division's total nonagricultural wage and salary employment. While many of these employees are associated with the operation of banks, insurance firms, and real estate operations, a significant number are employees of Native corporations. Employees of Native corporations can be considered part of the basic employment picture.

Unemployment and Seasonality of Employment: Employment in the Kodiak division exhibits much less seasonal variation than most Alaska areas with economies based heavily in fishing and fish processing. In 1976, the most recent year for which complete figures are available, total nonagricultural wage and salary employment in the Kodiak division ranged between about 83 percent and 129 percent of the annual average. This degree of seasonality is far less extreme than the Cordova-McCarthy division, for example, which has a greater dependence on the salmon fishery than Kodiak. Nevertheless, the Kodiak area exhibits more employment seasonality than the Anchorage division where total nonagricultural wage and salary employment ranged between about 92 and 107 percent of the annual average in 1976.

Unemployment in the Kodiak division varies seasonally. In 1976, local unemployment rates ranged between 5 and 6 percent of the total civilian labor force from July through October and between around 9 to 10 percent for the remainder of the year. The total civilian labor force peaked in August at 5,359 persons, with an unemployment rate of 5.7 percent recorded for that month. The "low" unemployment month was October when only 5.3 percent of the civilian labor force was recorded as unemployed. By October, the transient salmon fishermen have left the area and the total civilian labor force for that month in 1976 was down by approximately 1,000 persons from August. October normally sees a heavy king crab fishing effort before the winter weather sets in and, thus, a very low proportion of the labor force is recorded as unemployed at this time of year.

Recent Employment Trends: As shown in table III.C.2.b.-1, total nonagricultural wage and salary employment in the Kodiak division rose almost 69 percent between 1970 and 1976, a healthy rate of growth but lower than the approximately 84 percent rate recorded for the state as a whole. However, statewide figures were severely impacted by pipeline construction while the Kodiak area was little affected by this activity.

Employment in the manufacturing sector increased slightly more than 120 percent in the Kodiak division between 1970 and 1976. This represents a major gain in the area's primary basic industry, fishing and fish processing. To a large degree, this increase is due to a switch by a number of Kodiak area plants to more of a year-round operation which, aside from increasing total employment, has also tended to lessen the degree of employment seasonality. Growth in the miscellaneous sector, which includes some, but by no means all, of the area's fishermen, also registered a healthy 95-percent rate of increase between 1970 and 1976.

Contract construction accounted for the largest proportional increase (450 percent) in employment in the Kodiak division between 1970 and 1976. However, apparent gains in this sector are misleading. Construction activity appears to have been at an abnormally low level in 1970, whereas improvements to the Coast Guard base after this facility was taken over from the Navy contributed much to the higher levels of employment in this sector in the mid-1970's.

Employment in the service and trade sectors registered 114 and 48 percent gains, respectively, between 1970 and 1976, with some of this growth doubtless taking place in response to growth in basic industry. During this same period, however, employment in transportation, communication, and public utilities declined slightly (by almost 2%).

Government employment recorded a modest 6.7 percent rate of increase in the Kodiak division between 1970 and 1976. State and local government registered near 37 percent increase during this period, with most of this growth assumed to have taken place in the local government subsector. Federal Government employment, on the other hand, declined by 28.2 percent during the 1970-1976 period. This decline followed the closure of the Kodiak Navy base in 1971.

Occupational Skills: Comprehensive information on the skills of the workforce of the Kodiak area is not available, nor are there reliable or current statistics developed for individual communities.

Income Levels: According to the 1970 U.S. Census, the median income of families in Kodiak and the Kodiak census division in 1969 was $12,854 and $11,166, respectively. The median income for Kodiak was slightly above that statewide in 1969 of $12,443, whereas that for the census division were depressed by the former Kodiak Naval Station where a median 1969 income of only $8,645 was recorded. Thus, it can generally be said that the civilian population of the Kodiak area enjoyed incomes comparable or slightly above those statewide in 1969.

A review of average monthly wages by industry sector for nonagricultural industries in the Kodiak division from 1975 through the third quarter of 1977 indicates that the highest average monthly wages in this area are realized in the agriculture, forestry, and fisheries sectors. This group includes all fishermen counted in nonagricultural wage and salary statistics and realized an average monthly wage of $3,006 during the third quarter of 1977. No comparable group was listed statewide.

After agriculture, forestry, and fisheries, the highest average monthly wages in the Kodiak area during the third quarter of 1977 were registered in contract construction ($2,588). While this was a healthy average monthly wage, it was well below average rates recorded for the State during that quarter ($4,041).

Average monthly wages in the Kodiak division for the third quarter of 1977 were above those recorded statewide in the retail trade (($973 versus $960) and government sectors. In the government sector, the average monthly wage for the third quarter of 1977 was significantly above statewide averages in Federal ($1,885 versus $1,357), State ($1,824 versus $1,532) and local ($1,460 versus $1,386) government subsectors in the Kodiak division. In all other employment sectors, however, the average monthly wage in the Kodiak division was below State averages during this period.

Although unemployment is not generally seen as a problem in the Kodiak area, welfare payments in the form of general assistance from the Bureau of Indian Affairs and public assistance program payments distributed by the Alaska Department of Health and Social Services are significant sources of income to some Kodiak households. The Bureau of Indian Affairs distributed a total of $23,258 to 22 individual "cases" in the Kodiak area in FY 1977 (table III.C.2.b.-2). However, the total amount paid under this program in FY 1977 was less than half that paid out in FY 1972.

Statistics provided by the Alaska Department of Health and Social Services Division of Public Assistance indicate that $24,771 was distributed to 113 individual "cases" in Kodiak during a typical month in 1977, for an average monthly payment of $113 (table III.C.2.b.-3). Almost 80 percent of these funds involved Aid to Families with Dependent Children payments.

Major Industries

Fishing and Fish Processing Industry: See graphics 3 through 8 and section III.B.2. for details regarding this subject.

Tourism Industry: Tourism is currently a minor economic activity in the Kodiak area, but it is an industry which has some potential for expansion. Kodiak has traditionally been somewhat "off the beaten track" for tourists. See sections III.C.4. and III.C.6. for further information on tourism and transportation.

Table III.C.2.b.-2
General Assistance Payment [1]
Kodiak, Alaska
FY 1972 - FY 1977

	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976	FY 1977
Total Payment	$50,067	$60,758	$20,802	$21,796	$16,859	$23,258
Number of Cases	55	66	29	39	12	22
Average Payment:						
Annual	$ 910	$ 921	$ 717	$ 559	$ 1,405	$ 1,507
Monthly	$ 76	$ 77	$ 60	$ 47	$ 117	$ 88

1/ Payments made by the Bureau of Indian Affairs.

Source: Alaska Consultants, Inc., 1979. Table 89, p. 416.

Table III.C.2.b.-3
Public Assistance Program Payments
Kodiak, Alaska
October 1977 [1]

	Old Age Assistance	Aid to the Blind	Aid to the Disabled	Aid to Families with Dependent Children	Total
Total Payment	$ 2,652	$ 259	$ 2,484	$19,376	$24,771
Number of Cases	23	2	19	69	113
Average Payment	$ 115	$ 130	$ 131	$ 281	$ 219

1/ October is considered to be a representative month for public assistance payments.

Source: Alaska Consultants, Inc., 1979. Table 90, p. 416.

Kodiak has expressed interest in increased tourist activity. According to Kramer, Chin, and Mayo (October 5, 1977), the Kodiak Chamber of Commerce has created a "visitors and convention bureau" for the purpose of seeking conventions and the development of pre-convention tours in conjunction with the city of Anchorage. In addition, Kramer, Chin, and Mayo reported that tour ship calls at Kodiak could show further increases in the future.

Military Industry: The military has been a factor in Kodiak's economy since 1941 when the Kodiak Naval Air Station was established. A naval operating base and submarine base were added in 1974 and Fort Greely, an Army garrison, was also established here during this period. According to Chaffin (1967), there were some 2,500 civilian contract workers in Kodiak, an Army garrison of 7,600 and around 773 Navy men at the peak of wartime activities.

Today, military activities play a significant, but much less dominant role in Kodiak's economy. Fort Greely closed with the cessation of hostilities in World War II but the naval base remained. Increases in personnel occurred during the Korean War and again in the early 1960's, but World War II total military personnel levels were never again reached. According to Development Research Associates, Inc. (February 27, 1968), there were approximately 2,436 military personnel in the Kodiak area in 1965 but that this had dropped significantly to 1,693 in 1967, plus 313 civilian employees. Naval strength continued to decline after 1967 and the base was formally closed in 1971, shortly after which it was taken over by the U.S. Coast Guard.

The Coast Guard has been active in the Kodiak area since the summer of 1947 when an air detachment with 37 men and a couple of planes was stationed here. By 1957, the air detachment had assumed several other duties and had 12 pilots and 50 enlisted men. In addition, the Coast Guard cutter, Storis, which currently has a complement of 79 men, was stationed in Kodiak that year. Coast Guard strength in the Kodiak area continued to increase and, at the time of its takeover of the the Navy facility in 1972, approximately 500 military personnel were stationed in the community.

Since 1972, the number of Coast Guard personnel stationed in the Kodiak area has almost doubled. According to Kodiak Coast Guard planners, there are currently about 980 active duty military personnel in this area, plus approximately 175 civilian employees. All but about a half dozen military personnel live on base, but an estimated half of the civilian employees live in Kodiak itself. Including dependents, Kodiak has an on-base population of around 2,500 people. This figure includes some other nonmilitary personnel such as employees of the Federal Aviation Administration, the National Weather Service, and the National Marine Fisheries Service.

Today, the Coast Guard has 10 commands in the Kodiak area. These include the support center, the air station, the Spruce Cape and Narrow Cape Loran stations, three homeported cutters (the Storis, the Citrus, and the Confidence), marine safety, communications, and the Loran monitoring station. In terms of employment, the support center (with 292 military and 150 civilian employees), the three cutters (with a combined total of 199 men), the air station (with 351 employees) and communications (with 49 men) are the most significant. However, three other commands: marine safety (1975), the Narrow Cape Loran station (1977), and the Loran monitoring station (1977) have only recently been established. The tenth command, the Spruce Cape Loran station, is scheduled to be

phased out as of December 31, 1979. However, since this command has only eight employees, its closure will have only a very minor impact on military employment in the Kodiak area.

Military-related activities are normally associated with low multiplier factors in terms of their ability to support secondary employment. To some extent, this is true in Kodiak since almost all personnel live on base and have post exchange privileges. Furthermore, except for education and telephone services, the base makes few demands on local community facilities. Nevertheless, the Coast Guard does have a significant impact on Kodiak's economy in that it is a major civilian employer and that it acts as a support for Kodiak's primary industry, fishing and fish processing. Furthermore, unlike the former Naval station which had few dependents, the Coast Guard base has a large dependent population, some of whom work in town.

According to Kodiak Coast Guard planners, current personnel levels in this area are likely to remain fairly constant in the future. Recent increases in military strength at Kodiak have been primarily in response to the establishment of a 200-mile offshore U.S. territorial limit and to an upgrading of Coast Guard communications systems. Even if commercially significant discoveries of oil and/or gas should be made offshore in this area, no large increases in military personnel at Kodiak are anticipated. In the opinion of Kodiak Coast Guard planners, the base has adequate flexibility to handle such situations without major increases in personnel.

Timber Industry: The wood products industry is not important on Kodiak Island. However, nearby Afognak Island presently is within the Chugach National Forest and has a sizable commercial timber resource, estimated by the Forest Service (July 12, 1974) at 4.6 billion board feet of presently operable sawtimber. Commercial Sitka spruce stands occupy approximately half of Afognak Island's 185350 hectares (458,000 acres) area. If these stands were managed for sawtimber products, the Forest Service has estimated that they could sustain an annual cut of approximately 30 million board feet.

A large timber sale on Afognak Island, the 48563.3 hectares (120,000 acres) Perenosa sale, was held in 1968. Of this area, 8498.6 hectares (21,000 acres) were to be clearcut. However, no activity on this sale took place until the fall of 1975. Since that time, approximately 7.5 million board feet are going to the mill at Jakolof Bay near Seldovia and 5.5 million board feet have been cut for round log export as the result of an agreement between the Forest Service and the eventual Native landowners. (Privately owned lands are not subject to the primary manufacture before export requirement.)

A smaller 6.7 million board feet timber sale at Raspberry Strait was held in November 1971. The successful bidder was Dalmond Valley who subsequently third partied it to Southcentral Timber Development Corporation, a Japanese-controlled firm, in February 1973. This sale was closed in February 1977. The future of the wood products industry on Afognak Island is presently obscured by uncertainties as to who will ultimately control the island's timber resources. Koniag, Inc. the regional Native corporation for the Kodiak Island area, has proposed to select all of Afognak Island except for authorized Native village selections. At the other extreme, non-village selections, approximately 125455.3 hectares (310,000 acres), are proposed to be transferred to the National Wildlife Refuge System. If the latter case came to pass, it is assumed

that no logging on refuge lands would take place and the wood products potential of Afognak Island would thus be greatly reduced, as would its potential impact on the economy of the Kodiak area.

Cattle Industry: Cattle ranching has been a minor element in the economy of Kodiak Island for a number of years. Currently, there are 6 or 7 ranches on the island on lands leased from the Bureau of Land Management, which support a total of about 2,000 cattle. An approved slaughterhouse facility at Woman's Bay about 16 kilometers (10 mi) south of Kodiak is cooperatively owned by Kodiak ranchers and was financed by State revolving loan funds. Although this slaughterhouse could probably accommodate several thousand animals, only between 30 and 300 head are slaughtered annually. Carcasses are normally sold locally on Kodiak Island, although some are occasionally shipped to Anchorage.

The potential for major expansion of cattle ranching on Kodiak Island appears very limited, at least in the short term.

Local Government Finances: Kodiak's most recent audit was reviewed as were operating revenue sources for the Kodiak Island Borough school district. In addition, data developed by the State Assessor on property valuation, local tax rates, and per capita debt were analyzed.

A review of the full value of property, as determined by the State Assessor (Alaska Taxable) within Kodiak's corporate limits and the Kodiak Island Borough boundaries from 1969 through 1977 was undertaken (table III.C.2.b.-4). According to the State Assessor's records, the full value of property in the city of Kodiak increased 221.4 percent during this period, while that for the borough as a whole rose a slightly lower 189.2 percent. The city accounted for 73 percent of the full value of property in the borough in 1969, whereas, in 1977, the city's share had risen to 81.2 percent of total property valuation. Growth in the city's property valuation has generally been more rapid since 1973, with most of this growth believed to have been derived from the continued expansion of the area's fishing and fish processing industry which is heavily concentrated within Kodiak's corporate limits.

A review of local and areawide property mil and sales tax rates applicable to Kodiak since the 1972-73 fiscal year (table III.C.2.b.-5) and a comparison of these rates with those of other Alaska municipalities indicates that, given the level of service provided, residents of the city of Kodiak are taxed at a rate which compares favorably with that of most other urban areas in the State. In 1977-78, property tax rates for the city of Kodiak were set at 16.33 mils, the same as for the previous year. Of this assessment, 9.10 mils were remitted to the city and the remainder was retained by the borough for administration (2 mils) and schools (5.23 mils). For the current fiscal year, the mil rate has been set at 16 mils, with the city share remaining the same and the borough assessment for schools dropping slightly to 5 mils.

The Kodiak Island Borough does not levy a sales tax. However, a 3-percent sales tax levied by the city of Kodiak is collected by the borough and remitted to the city. A portion of these revenues is remitted to the borough by the city in lieu of personal property taxes which are levied throughout the borough, except within Kodiak's corporate boundaries.

Table III.C.2.b.-4
City of Kodiak and Kodiak Island Borough
Comparison of Full Value Determination
1976 - 1977

(in $000's to nearest $1,000)

Year	City of Kodiak	Total Kodiak Island Borough
1969	$ 44,118	$ 60,399
1970	$ 40,749	$ 57,751
1971	$ 51,092	$ 70,069
1972	$ 52,905	$ 75,956
1973	$ 53,729	$ 75,323
1974	$ 72,616	$ 96,246
1975	$ 80,284	$ 112,324
1976	$ 110,316	$ 145,764
1977	$ 141,802	$ 174,702

Source: Alaska Consultants, Inc., 1979. Table 105, p. 516.

Table III.C.2.b.-5
City of Kodiak and Kodiak Island Borough
1972/73 - 1977/78

	Property Tax (mils)					
	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78
City	8.20	8.60	8.60	8.60	9.10	9.10
Borough Admistration	.40	.40	1.62	2.50	2.00	2.00
Borough Schools	4.48	4.48	4.24	3.30	5.23	5.23
TOTAL	13.08	13.48	14.46	14.40	16.33	16.33

	City Sales Tax (percent)					
	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78
Administration	3.00	3.00	3.00	3.00	3.00	3.00
TOTAL	3.00	3.00	3.00	3.00	3.00	3.00

Source: Alaska Consultants, Inc., 1979. Table 106, p. 518.

An analysis of the city of Kodiak's general fund revenues and expenditures for the fiscal year ended June 30, 1977, (table III.C.2.b.-6) was undertaken. A very high proportion (close to 80%) of Kodiak's general fund revenues is derived from local sources. Total general fund revenues for FY 1977 amounted to $3,458,977. Of this, by far the greatest share (52%) was derived from taxes, with sales taxes alone accounting for 35.8 percent of all general fund revenues, followed by property taxes (15.8%) plus a minor amount collected in the form of penalties and interest on delinquent taxes. Aside from taxes, other major sources of general fund revenues for the city of Kodiak in FY 1977 were inter-fund receipts (23% of the total) and intergovernmental revenues (12.3%).

Although Kodiak's general government revenues are primarily derived from locally generated funds, this is not the case with education services provided by the Kodiak Island Borough. According to figures provided by the Alaska Department of Education approximately 91 percent of total operating revenue sources for the borough school system in FY 1977 came from State sources, compared with slightly less than 8 percent from local (borough) revenues.

A look at Kodiak's general fund expenditures in table III.C.2.b.-7 for the year ended June 30, 1977, indicates that the largest single area of expenditure, accounting for 34.8 percent of the total, was in a category described as nondepartmental charges divided among miscellaneous (most of which was taken up in lieu of tax payments to the borough but with insurance and utilities payments also significant) debt service and inter-fund transfer (primarily from the water utility and HUD block grant funds) line items. Other major areas for city expenditures in FY 1977 were public safety (27.2% of total general fund expenditures), public works (20.3%), and general government (10.4%).

A review of Kodiak's overall financial condition indicates that the city's financial position is generally sound. According to the State Assessor's records, the city has a higher per capita property valuation compared with most other Alaska communities.

In addition to outstanding general obligation bonds, Kodiak also has a total of $5,093,000 in revenue bonds outstanding as of June 30, 1977. While these are a long-term financial obligation of the city, they are not classed as a debt since their repayment is theoretically covered by incoming revenues.

Village Economies: Table III.C.2.b.-7 is a detailed summary of types of employment within the Koniag Region Villages. Refer to section III.C.1. for further information regarding Kodiak Island villages.

The six villages on Kodiak Island lack stabilized employment opportunities. The majority of the village residents are still dependent upon salmon fishing during the summer months. With the exception of a couple of villages, it appears that village residents will not move toward diversified fisheries, crab, shrimp, etc., for sometime due to lack of capital to purchase larger boats as a result of the decline of salmon runs. Lack of water and sewage treatment facilities also contributes to the limited economic base. Boat harbors are non-existent as are airports.

Table III.C.2.b.-6
General Fund
Statement of Expenditures and Encumbrances
City of Kodiak
For the Year Ended June 30, 1977

	Expenditures and Encumbrances
General Government:	
Legislative	$ 10,353
Legal	53,955
Executive	39,914
Clerk	63,012
Finance	163,772
Total General Government	$ 331,006
Public Safety:	
Police Department	$ 618,148
Fire Department	247,969
Total Public Safety	$ 866,117
Public Works:	
City Engineer	$ 107,693
Administration and Buildings	84,023
Utilities	131,658
Streets and Snow Removal	232,607
Garage	90,973
Total Public Works	$ 646,954
Parks and Recreation	$ 104,257
Museum	$ 13,695
Library	$ 114,868
Non-Departmental Charges:	
Miscellaneous	$ 582,690
Debt Service	139,440
Transfers	384,021
Total Non-Departmental Charges	$1,106,151
	$3,183,048

Source: Alaska Consultants, Inc., 1979. Table 107, p. 520.

Table III.C.2.b.-7
Types of Village Employment
Koniag Region

	Total Labor Force	Summer Employment		Year-round Employment		Nine-month Employment	
Akhiok	40	32	80%	5	12%	3	7%
Karluk	31	20	64%	5	16%	3	19%
Larsen Bay	52	100	100%	6	11.5%	6	11.5%
Old Harbor	190	100	100%	13	7%	31	16%
Ouzinkie	64	55	86%	6	9%	3	5%
Port Lions	166	52	31.3%	26	15.7%	88	53%

Source: Kodiak Island 5-Year Health Plan (1979).

Primarily, the bulk of the people living within the villages in the Koniag Region are employed in the fisheries industry. They are employed in the harvest phase as fishermen or in the processing phase as cannery or cold storage workers. The employment is highly seasonal and competitive, due to the economic conditions in the continental United States forcing people to find work away from their homes (college students seeking summer employment) and the fact that the fisheries have in the past years been over-harvested.

In the past years, fishing limitations have been imposed and harvesting has only been allowed 2 or 3 days per week during the summer fishing season. The Koniag Region does have fledgling tourist and forestry industries--neither of these industries employs a significant number of Alaska Natives. As a result of the above conditions, the greatest bulk of the people, particularly in the villages, are employed only for a few weeks out of each year and compensation they receive for their work only allows for meager existence.

The overall unemployment rate for the service area has been 9.6 percent for the past 2 years. This high unemployment is due to the fisheries industry, which is totally seasonal. In support of this fact, the 1974 borough census reports a total of 282 individuals employed in the private sector. An additional 27 individuals are employed by State, Federal, and local government programs. The average income for a family of four in the villages ranges from $3,000 to $6,000 annually.

The greatest employment needs in the service area includes legal services, health and educational services, administrative services, secretarial, bookkeeping, and public service.

A summary of the reliance upon subsistence is presented in table III.C.2.b.-8. Refer to section III.C.1.d. for more information regarding subsistence.

b. Local Economy - 2, Kenai Census Division: The analysis of the Kenai-Cook Inlet Census Division below is taken from Alaska Consultants, Inc. (1980). The economic base of the Kenai-Cook Inlet Census Division of the Kenai Peninsula Borough is built primarily upon the oil and gas industry, fishing and fish processing, and the tourism and recreational industries. Over the past two decades, the expansion of these basic industries has greatly broadened the region's economic base, although the course of expansion has not been smooth. In particular, the labor intensive character of the construction of key industrial facilities has made the Kenai-Nikiski area prone to repeated boom-bust cycles through successive stages of economic expansion.

Between 1970 and 1977, Alaska Department of Labor nonagricultural wage and salary employment data indicate that employment in the Kenai-Cook Inlet Labor Area doubled from 3,640 to 7,332. Within the Kenai-Cook Inlet Labor Area, the Department of Labor collects insured employment data for local subareas, three of which (the Kenai labor area, the Soldotna labor area, and the Homer labor area) are important for this baseline analysis.

Over recent years, the geographic distribution of employment in the region has become steadily more concentrated in the Kenai-Nikiski industrial area.

Composition of Employment: The composition of employment in the Kenai-Cook Inlet Census Division reflects the strong role that the oil and gas industry,

Table III.C.2.b.-8
Reliance Upon Subsistence

The lifestyle of the coastline area depends on a subsistence way of life. The subsistence species consist of: salmon, crab, shrimp, clams, deer, rabbits, ducks, seal, and ptarmigan.

	Akhiok	Karluk	Larsen Bay	Old Harbor	Ouzinkie	Port Lions
Percentage of dependence on subsistence	60%	80%	53%	*	**	60%

* No figures available, but a significant dependence on subsistence.
** Heavy dependence on subsistence.

Source: Kodiak Area Native Association, CETA Title VI - Public Service Employment Proposal, July 1977.

petrochemicals, and fish processing play in the region's economic base. In 1977, the most recent year for which complete nonagricultural wage and salary employment data are available, about 721 jobs or 9.8 percent of the total were in mining, mostly in oil and gas extraction; and another 1,015 jobs or 13.5 percent were in the maufacturing sector. For comparison, mining provided only 3.0 percent of statewide employment and maufacturing only 6.6 percent. Thus, the prominence of extractive and manufacturing activities lends a decidedly industrial quality to the Kenai-Cook Inlet region's economy which is uncharacteristic of most regions in the state.

The largest single economic sector in 1977 was contract construction, in which 1,808 jobs, or 24.7 percent of total nonagricultural wage and salary employment here were reported. However, 1977 set an all-time high for construction activity in the region as the Union Oil Company's Collier Carbon and Chemical Corporation's ammonia-urea plant, Alaska's first and largest petrochemical plant, undertook a major expansion program during this period. Other private and public construction activities were also abnormally high. As a result, the 1977 job level was not at all representative of historic or expected future levels of employment in the region's construction industry. For example, data for the first three quarters of 1978 show that average monthly employment in contract construction fell to 481 jobs or about one quarter of the previous year's average. This precipitous decline in construction employment upon completion of a major project is typical of the pattern of boom-bust cycles to which the region's economy has proven susceptible.

The exaggerated expansion-contraction cycle and the high job turnover it causes is probably an important factor in the high unemployment rate which has afflicted the region, without regard for permanent employment gains. Thus, in 1978, the unemployment rate was substantially higher than in 1970.

Within the recent timeframe of 1977-78, spanning the construction of the addition to the Union Oil Company petrochemical plant, available economic data reveals a sharp recessionary trend. This trend is evident in the parallel movements of employment levels and payrolls. In the six months between the third quarter peak of 1977 and the first quarter of 1978, employment declined by 31 percent from 8,370 jobs to 5,789. As might be expected, the bulk of this decline took place in the construction sector which fell from 2,243 jobs to 364, a decline of 84 percent.

Sector Analysis: The Cook Inlet commercial fishery can be dated back to the late 1800's and for many years fishing was the chief basic industry for the small coastal towns of the western Kenai Peninsula. That changed after the mid-1950's. First the completion of the Sterling Highway opened the area's varied recreational assets to Anchorage area residents. Then, the discovery of commercial oil and gas resources in the Cook Inlet Basin transformed the Kenai-Nikiski area into the center of a major oil and gas producing and processing industry.

As the process of economic diversification progressed, a definite geographic differentiation in economic functions among the main towns in the western peninsula has evolved. The City of Kenai and its neighboring Nikiski-North Kenai area have become the heart of oil and gas related industries and a center of trade and commerce for the western peninsula. Soldotna, the seat of

the Kenai Peninsula Borough, has become the center for government and educational services, as well as a bedroom community for other employment centers within the commuting distance. In the lower Cook Inlet area, Homer and Seldovia have remained strongly tied to the fishing industry, with Homer also becoming a popular destination for recreational visitors and tourists.

Oil and Gas: When the Richfield Oil Corporation discovered natural gas in the Swanson River area in 1957, the Kenai area was launched upon the path to its singular role as the center of Alaska's oil and gas industry. The Prudhoe Bay fields now produce far more oil and have far greater natural gas reserves than the Cook Inlet Basin. The Valdez terminal for the trans-Alaska pipeline ships more crude oil and Anchorage has become the managerial headquarters for the oil industry in Alaska and for its counterpart governmental bureaucracy. But no region of Alaska has achieved the diversity of oil- and gas-related development that the Kenai-Nikiski area has attained.

The Kenai oil and gas region has grown to become the focus of a mature oil and gas industrial complex. It hosts a full range of oil field service and supply industries. It is at the heart of a far-flung network of pipelines for collection of crude oil and natural gas production. It harbors treatment facilities, refineries, a petrochemical plant, an LNG plant and marine facilities for transfer of crude oil and LNG and for support of offshore oil operations. It is the source of product pipelines to Anchorage area utilities and consumers of Cook Inlet hydrocarbon energy production.

In short, the Kenai vicinity possesses a representative array of oil and gas industrial facilities. The cumulative production of hydrocarbons in the Cook Inlet basin through 1976 amounted to 755 MMbbls of oil, over 2 Bcf of casinghead and dry gas and over 5 MMbbls of natural gas liquids. Annual oil production peaked in 1970 at 84 MMbbls. Annual natural gas production first exceeded 200 MMcf in 1970 and has continued to rise, attaining a new peak in 1976 of 271 MMcf. Despite the decline in oil production, the oil and gas industry and federal and state landlords are optimistic that the Kenai region still has a solid future in production and processing of oil and gas reserves imputed to tracts recently leased and to those anticipated to be soon leased for exploration.

Since 1957, the Kenai-Cook Inlet area's economy has moved in response to oil and gas development decisions. Development and production of the onshore and offshore oil and gas fields represented, of course, a major addition to the region's previously slight economic base. However, far more consequential than mere oil and gas production was a series of entrepreneurial choices about product processing and marketing that fostered Kenai's emergence as an industrial center.

In the case of oil, the significant choice was the decision to retain some crude oil for refinement into products for Alaskan markets. In the case of natural gas, it was the decision to convert gas in excess of the region's needs into exportable products. The outcome of these choices led to the construction of four major industrial plants in the Nikiski area in a brief few years. The construction of these plants and subsequent plant additions imposed on Kenai the cycle of boom growth and faltering readjustment that it has repeatedly undergone in the past 15 years.

The first major hydrocarbon facility to be completed was the SOCAL (now Chevron) oil refinery completed in 1963 at Nikiski. This plant produced asphalt, heating, and diesel oil, jet fuels, and other products for Alaska consumption, with a processing capacity of 22,000 barrels of oil per day. At present, the plant has 21 full-time employees.

The Drift River crude oil storage and loading facility on the west shore of Cook Inlet was completed in 1967, along with oil treatment facilities at Trading Bay and a network of gathering pipelines and stations. These facilities collect offshore production for export. The Drift River terminal currently employs about 17 workers and the Trading Bay treatment facility about 60 persons. Because these facilities are at remote sites on the west shore, their construction and operation have had relatively little direct impact on the Kenai area.

Limited amounts of Cook Inlet basin natural gas production are consumed in the region for power production and other purposes. However, natural gas production potential is far in excess of Southcentral Alaska demand. Since the remoteness and scale of the Cook Inlet gas fields precluded the economic feasibility of delivery to markets by a conventional pipeline, producing companies adopted two other alternatives for realizing the economic value of Cook Inlet gas finds. The Collier Carbon and Chemical Corporation, a subsidiary of Union Oil Company, built a petrochemical complex designed to use natural gas to manufacture ammonia-urea fertilizers which, unlike natural gas, could be economically transported in bulk carriers to distant markets. Phillips Petroleum Company and Marathon Oil Company, on the other hand, jointly built and operate a plant to liquefy natural gas for shipment by LNG tanker to Japan.

Upon its completion in 1968, the Collier ammonia-urea plant at Nikiski was Alaska's largest petrochemical plant and one of the largest of its type in the world. In 1977, two additional plants units were added which doubled the plant's capacity and employment. The facility now is able to produce 725,624 metric tons (800,000 tons) of urea and 997,732 metric tons (1,100,000 tons) of ammonia fertilizers annually. Reportedly, most of the output is destined for West Coast markets. The plant now has about 315 full-time employees.

The Phillips-Marathon LNG plant was built and on stream by 1969. This plant liquefies natural gas by chilling it to -162°C (-260°F). Liquefaction reduces the product volume by a factor of 600. The liquefied natural gas is then shipped by specially designed LNG carriers to Japan. Plant operation employs 41 persons.

Also completed in 1969 was the Tesoro-Alaska refinery. This plant has a capacity of 45,000 barrels a day and produces gasoline, diesel oil, jet fuels, and a variety of other end products for Alaska consumption. Its current employment is 48 persons.

Cumulatively, the above industrial facilities directly account for over 500 permanent, non-seasonal manufacturing jobs in the Kenai-Cook Inlet region, mostly in the Nikiski area. This does not include employment in oil and gas exploration, development and production activities. As of 1978, these activities accounted for an estimated further 750-800 jobs in the region in the mining sector. This is up by about one hundred jobs over 1977, possibly due to new offshore exploration efforts following the federal Lower Cook Inlet OCS

lease sale in October 1977. The first exploratory well in that lease area was spudded in July 1978 by Marathon Oil Company's drill ship, Diamond M. Dragon on the premier tract for which Marathon and its partners bid $77 million. That well has since been abandoned as a dry hole but a number of additional wells have been started or are in the planning stage.

Oil field service and supply industries also contribute a significant share of employment to the transportation, service and other economic sectors. A review of telephone listings for the Kenai-Nikiski-North Kenai-Soldotna area indicates that there are between 65 to 75 local firms engaged in a wide range of oil and gas industry support functions, but there is no count of the number of individuals these firms employ.

Fishing and Fish Processing: See graphics 3 through 8 and discussions on the back of graphics 5 through 8 for details regarding this subject.

Tourism and Recreation: After oil and gas and fishing and fish processing, the tourism and recreation industry has grown to be, the most important component of the Kenai-Cook Inlet region's economic base. The coastal strip of the western Kenai Peninsula between Kenai and Homer is reported by the Alaska Department of Natural Resources, Division of Parks, to be the most intensively used outdoor recreational area in the state. Refer to section III.C.4. for a more detailed description of the area's recreation resources.

The economic impact of the visitor industry is highly concentrated at Homer on the Homer Spit and, also at Kenai, the point of access to the recreational areas of the northwest section of the peninsula. Otherwise, the economic impact is scattered at points along the Sterling Highway where service stations, road houses, and other highway oriented businesses catering to visitors are located. These local commercial impacts can be distinguished from the recreational user impacts which tend to concentrate at public campgrounds, clamming beaches, creeksides, lake fronts, trails, and other points or corridors with exceptional public recreational value. Only at certain spots, as on the intensely used Homer Spit, do the focus of recreational activity and commercial impact coincide.

Although the specific findings of past surveys differ, they are consistent in the theme that the primary pursuit of visitors to the Kenai Peninsula is an outdoor recreational experience of a sort that does not entail, and may even be adverse to, expenditure of large sums for local goods and services.

Regardless of average expenditures, the volume of visitors to the Kenai is such that its quantitative contribution to trade and services in the region's basic economy is impressive. According to a 1972 study of the economic impact of visitors published by the OEDP Committee, a sample survey of businessmen estimated that the visitor industry accounted for about 31 percent of all retail trade in the Kenai Peninsula. If this is accepted as a valid ratio, a rough estimate might be that about 582 of the average annual figure of 1,876 persons employed in trade and services in the Kenai-Cook Inlet area in 1977 could be attributed to the visitor industry.

Another important feature of the visitor industry in the Kenai Peninsula is that it is highly seasonal. Since outdoor recreational activities are the prime attraction, summer is the time of peak activity. This seasonal cycle

comes through clearly in employment data for the Homer Labor Area, the area proportionately most impacted by the visitor industry. Trade and services are the two economic sectors which best show the effect of the visitor industry. In 1978, Homer area employment in trade in the high summer was 50 percent above the low winter month; in the services industry, the spread was nearly 150 percent. Besides the seasonal cycle, summertime visitor traffic from the Anchorage area is heavily skewed toward weekends, when people are most often free for recreational pursuits.

Other: Apart from the oil and gas, fishing and fish processing, and visitor industries, a variety of other economic activities make minor contributions to the Kenai-Cook Inlet area's basic economy.

In the years since the western Peninsula was made accessible by the completion of the Sterling Highway, the agricultural potential of the region has been tested by extensive homesteading. While there are tracts which are physically suitable for agriculture and livestock, particularly in the Homer area, economic conditions have not proven favorable enough to promote any extensive agricultural development. Also, the economic feasibility of agricultural enterprises has been adversely affected by the effect of competing uses on land values and land use patterns. Consequently, agriculture has remained a marginal economic endeavor and can perhaps most realistically be considered as a transitional land use.

The timber resources of the Kenai-Cook Inlet area are currently supporting a commercial harvest. The major milling operations are at Tyonek on the west shore of Cook Inlet and at Jakolof Bay on the south side of Kachemak Bay. (However, most timber processed at Jakolof Bay presently comes from Icy Bay, outside the Kenai Peninsula Borough region.) Small mills are also in occasional operation at Soldotna, Anchor Point, and Homer producing sawtimber for local use. Of the three latter towns, Homer is best situated to serve as a yarding, milling, and shipping point for wood products. However, the potential competition for space, especially for waterfront industrial use, and available labor between the wood products industry and the economically more important fishing industry, have inclined the city of Homer to downplay development of a local wood products industry in favor of continued emphasis on fisheries development and the visitor industry.

Until the early 1970's, the military was a significant element in the population and economy of the city of Kenai vicinity. As of 1970, there were 750 military personnel, including dependents, stationed at Wildwood Station, just north of the city. However, now that the station has been closed and the facilities transferred to the Kenai Native Association, the economic role of the military is negligible.

c. Local Kenai, North Kenai Economy:

Employment: In 1970, the Kenai labor area which includes Nikishka, Nikiski, Red Mountain, Swanson River, and Wildwood Station was already the primary employment center in the Kenai-Cook Inlet region with 47.3 percent of the region's total employment. The Kenai labor area has since become increasingly dominant. By 1977, it provided 56.6 percent of the region's jobs.

Because of the impact of two large industrial construction projects in the Nikiski area, 1977 was not a "typical" employment year for the Kenai labor area. Indeed, no single year can be typical in such a volatile local economy. Nevertheless, the 1977 data do illustrate to an exaggerated degree the distinctive features of the local and regional economy. It was previously noted that the construction, mining, and manufacturing sectors employ a larger share of the work force in the Kenai-Cook Inlet region than they do in the state as a whole. In the smaller Kenai labor area, a subunit of the Kenai-Cook Inlet Census Division, the concentration of employment in these three sectors was even more intense. In 1977, the Kenai labor area provided 84.9 percent of the region's mining employment and 84.3 percent of its construction employment.

Within the Kenai labor area, these same three sectors, construction (37.0%), mining (14.7%), and manufacturing (14.2%) accounted for almost two-thirds of total insured employment in 1977 (table III.C.2.c.-1). On the other hand, there was an unusually low percentage of government workers (9.1%) and transportation, communications, and public utilities employees (5.0%). Keeping in mind that the Kenai labor area's 1977 employment pattern was highly distorted by heavy industrial construction, the 1977 data reflect the extraordinary impact upon the local workforce of periodic industrial development projects, a tendency which will continue until the area's employment base becomes larger and more diverse.

The Anchorage Urban Observatory conducted a sample survey of adult employment by economic sector in the city of Kenai (table III.C.2.c.-2). A comparison of these figures with 1976 Department of Labor employment data for the entire Kenai labor area, suggests that employment patterns in the city of Kenai are not radically different from the Kenai labor area as a whole, including the unincorporated North Kenai area to the north of the city.

Since many commercial fishermen are self-employed persons, nonagricultural wage and salary employment data published by the Alaska Department of Labor fail to reflect fully the economic contribution of this industry. However, some indication of the extent to which Kenai area residents participate in the Cook Inlet commercial fishery can be obtained from the records of the Commercial Fisheries Entry Commission. Based upon the addresses given on permit applications, 272 persons resident in the Kenai-north Kenai area obtained a total of 309 commercial fishing permits in 1975. The number of permit holders does not include additional crew members on fishing boats and also because permit holders operating out of the Kenai-north Kenai area do not necessarily list this area as their residence. On the other hand, given the concentration on the salmon fishery in upper Cook Inlet, fishing is an extremely seasonal source of employment in this area. However, if the count of permit holders is accepted as approximately representing the number of active resident fishermen, then commercial fishermen increased the cited employment figures for the Kenai labor area in 1975 by about 10 percent.

In weighing the local importance of the commercial fisheries, it should be kept in mind that most (230 of 309) permits issued to Kenai area residents were for set nets (127) and drift nets (103) the small scale gear. Thus, the Kenai-based fishing industry is strongly oriented to the highly seasonal Cook Inlet commercial salmon fishery. In effect, commercial fishing is a part-time livelihood for many if not most participants, often supplemented by sources of income from other occupations.

Table III.C.2.c.-1
Nonagricultural Wage and Salary Employment Distribution
Kenai Labor Area [1/]
1970-1977

	1970		1977		1970-1977
	Number	%	Number	%	% Change
Agriculture, Forestry, and Fisheries	2/		2/		
Mining	455	26.4	612	14.7	34.5
Contract Construction	282	16.4	1,535	37.0	444.3
Manufacturing	271	15.7	588	14.2	117.0
Transportation, Communications and Public Utilities	134	7.8	206	5.0	53.7
Trade	271	15.7	584	14.1	115.5
Finance, Insurance, and Real Estate	46	2.7	92	2.2	100.0
Service	190	11.0	430	10.4	126.3
Miscellaneous	0		2/		
Government	70	4.1	2/		
Federal	2/		2/		
State & Local	2/		2/		
TOTAL	1,723	100.0	4,150	100.0	140.9

1/ Includes Nikishka, Nikiski, Red Mountain, Swanson River, and Wildwood Station.
2/ Employment figures withheld to comply with disclosure regulations.

Source: Alaska Consultants, Inc., 1980. Table 7, p. 24.

Table III.C.2.c.-2
Distribution of Total Adult Employment
By Economic Sector
City of Kenai
1976

	Percent
Agriculture and Commercial Fishing	4.2
Mining, Oil and Gas Production	20.5
Construction	14.0
Manufacturing (lumber and fish processing, oil and gas refining)	11.6
Transportation, Communications, and Public Utilities	4.7
Wholesale, Retail Trade	10.7
Finance, Insurance, and Real Estate	1.9
Services: Medicine, Law, Hotel, etc.	16.3
Government	16.3
Other	--
TOTAL	100.0
N =	(215)

Source: Alaska Consultants, Inc., 1980. Table 31, p. 89.

Recent Trends and Changes: The Kenai labor area has effectively become the bellwether for economic trends in the Kenai-Cook Inlet Census Division. Following the Collier Carbon and Chemical Corporation's Plant expansion project in late 1977, the Kenai-north Kenai area (and the Kenai-Cook Inlet region) experienced a sudden steep slide in employment. In the Kenai labor area, employment fell from the 1977 annual average of 4,150 workers to an annual average of 3,169 over the first 9 months of 1978. It is important to note that this was not an across-the-board decline. It was almost solely attributable to the dropoff in construction employment from 1,525 jobs in 1977 to a mere 197 in 1978, an almost instantaneous loss of 1,338 jobs. Many of these construction workers undoubtedly left the Kenai-north Kenai area, while other economic sectors showed strength and took up some of the overall employment slack. Most notably, manufacturing employment rose significantly with the addition of new jobs at the Collier plant to the permanent local workforce. Mining employment has also risen recently, probably due to ongoing oil and gas exploration in the Cook Inlet basin following the Lower Cook Inlet OCS sale. Other sectors of the economy have been holding fairly steady after 1977, suggesting that the period of post-construction project adjustment is over and that the local economy has temporarily stabilized in wait for the next surge of growth.

Income Levels: Various income measures consistently indicate that employees in the Kenai labor area enjoy comparatively high incomes. As early as 1969, according to the U.S. Census, the mean household income in the city of Kenai was $15,927, well above the mark of $14,150 for the Kenai-Cook Inlet Census Division and $13,856 for the state as a whole. A more recent sample survey of household incomes conducted by the Anchorage Urban Observatory found that city of Kenai families had a mean income of $31,771 in 1975. This was highest of the five major cities (Kenai, Soldotna, Seldovia, Seward, and Homer) in the Kenai Peninsula Borough and was well above the boroughwide (excluding Homer) mean of $28,946.

Also tending to support the conclusion that family incomes are above average in the Kenai-north Kenai area is the finding that the Kenai labor area employment mix includes a high proportion of workers in the better paid industrial sectors of mining and construction.

Public assistance programs appear to make a minor, though critical, contribution to the economic well-being of some Kenai area residents. In the month of March 1979, the various public assistance programs administered by the Alaska Department of Health and Social Services paid a total of $33,024 to 129 aid recipients in Kenai, with the bulk of the cases and funds being in the Aid to Families with Dependent Children category. In addition, the Bureau of Indian Affairs' general assistance program, which is administered by the Cook Inlet Native Association in this area, distributed a total of $21,118 in assistance payments in 1978. Considering the high unemployment rates which prevail in the Kenai region, the amount of income provided through public assistance programs appears modest for a community of Kenai's size.

Local Government Finances: Fiscal data from the city of Kenai's financial report for the fiscal year ending June 20, 1978, and other municipal financial data compiled and published by the State Assessor's Office were analyzed to evaluate the city's financial circumstances.

Property taxes are the leading source of general fund revenues for the city of Kenai. Property tax revenue yields depend directly on the value of the local property tax base. The city's equalized assessed valuation was reported at $109,700,000 in 1978 (table III.C.2.c.-3). This represents an increase of 175 percent over the assessed valuation of 1969, with most of the increase occurring in the most recent 2 years. During the same decade-long period, Kenai population increased by about one-quarter, so the property tax base has grown at a much faster rate than population, although a good share of the rise in assessed value can be dismissed as merely reflecting inflation rather than a real increase.

The ratio of assessed valuation to population is a good index of the revenue capacity of a locality. As of 1978, the city of Kenai's valuation was reported as $20,451 per capita. This ratio is far below the statewide average of $50,398 per capita. However, if the extraordinary effect of the trans-Alaska pipeline and related property on a few local jurisdictions is taken into consideration, then Kenai's per capita valuation begins to approach the norm.

As of June 1978, the city of Kenai had outstanding general obligation bonds in the amount of $4,425,000 and total general obligation debt service requirements of $6,527,817 through 1998 (tables III.C.2.c.-4 and -5). In per capita terms, this equalled a direct general obligation debt to the city of $825 per person, a figure well below the statewide municipal average of $1,421. Not included in this figure, however, is the city of Kenai's share of the Kenai Peninsula Borough's bonded debt. Prorating to the city of Kenai a share of the Borough's debt proportionate to the city's share of the boroughwide property tax base adds an additional $3,397,223 to the debt burden effectively resting upon the city's property tax base.

Compared to nationwide debt ratio indexes for cities of its size, Kenai is within satisfactory limits. By the key index of the ratio of bonded debt to assessed valuation, Kenai, at 4.03 percent, is in a superior position to the guidelines figure of 5.5 percent developed by Moody's Investors Service, Inc. for cities of under 10,000 population. However, if Kenai's share of the borough's debt included, the city has a less favorable 7.13 percent ratio of bonded debt to local assessed valuation. Nevertheless, the city's debt service capacity has improved substantially since 1976 when its local debt to valuation ratio was a very high 12.01 percent.

The city has also issued revenue bonds to finance its airport terminal building (outstanding balance of $467,500) and the Kenai City Light Utility (outstanding balance of $1,173,679), whose assets and debts were conveyed to the Homer Electric Association in August 1971.

The city's general fund expenditures in fiscal year 1978 amounted to $2,167,650 or better than $400 per resident. The major category of expense was public safety which commanded 39.8 percent of the budget, followed by general government (29.4%), public works (26.4%), and parks and recreation (4.4%). In Kenai's organizational structure, public safety includes both city police and fire protection services (table III.C.2.c.-6).

For general fund revenues, the City relies very heavily upon locally raised funds. The city property tax was the leading revenue contributor and provided 42.2 percent of general fund revenues. The city sales tax yielded 26.5 percent

Table III.C.2.c.-3
City of Kenai
Comparison of Full Value Determination
1970 - 1978
(in $000's to nearest $1,000)

Year	Full Value Determination
1970	$ 48,179
1975	$ 54,687
1976	$ 62,934
1977	$ 85,178
1978	$109,700

Source: Alaska Consultants, Inc., 1980. Table 54, p. 162.

Table III.C.2.c.-4
Indicators of Financial Condition
City of Kenai, Alaska
FY 1978

Population	5,364[1/]		
Full Value Determination		$109,699,805.00	
Full Value Per Capita		$ 20,451.00	
General Obligation Debt		$ 4,425,000.00	
Total Debt[2/]		$ 7,822,223.00	
Per Capita Debt			
General Obligation		$ 825.00	
Total		$ 1,458.00	
Debt as Percent of Full Value			
General Obligation			4.03%
Total			7.13%

Guidelines for Per Capita Debt

Direct	$	618.48
Overall	$	733.93
Percent of Full Value[3/]		5.50%

1/ Kenai's July 1977 population as accepted by the Department of Community and Regional Affairs for State Revenue Sharing Purposes.

2/ Total debt equals Kenai's G.O. bonded debt plus a prorated share ($3,397,223) of the Kenai Peninsula Borough's G.O. bonded debt based on the city of Kenai's accounting for 7 percent of the borough's 1977 full value determination.

3/ Median value for selected places of under 10,000 population used by Moody's Investors Services, Inc.

Sources: Alaska Consultants, Inc., 1980. Table 55, p. 163.

Table III.C.2.c.-5
City of Kenai
General Bonded Debt
Schedule of Future Dept Service Requirements
JUNE 30, 1978

Fiscal Year	Principal	Interest	Total Requirement
1979	$ 280,000	$ 239,070	$ 519,070
1980	290,000	223,520	513,520
1981	295,000	207,382	512,382
1982	265,000	190,520	455,520
1983	215,000	177,875	392,875
1984	230,000	166,393	396,393
1985	235,000	154,070	389,070
1986	255,000	141,230	396,230
1987	265,000	127,350	392,350
1988	280,000	112,605	396,605
1989	300,000	96,838	396,838
1990	310,000	79,885	389,885
1991	310,000	61,975	371,975
1992	310,000	44,362	354,362
1993	195,000	26,212	221,212
1994	70,000	18,815	88,815
1995	75,000	14,973	89,973
1996	80,000	10,865	90,865
1997	80,000	6,625	86,625
1998	85,000	2,252	87,252
	$4,425,000	$2,102,817	$6,527,817

Source: Alaska Consultants, Inc., 1980. Table 56, p. 164.

Table III.C.2.c.-6
General Fund
Statement of Revenues and Expenditures
City of Kenai
Year Ended June 30, 1978

Revenues	Actual
Real and Personal Property Taxes	$1,320,336
Sales Tax	828,054
Licenses and Permits	31,539
Intergovernmental Revenue	735,972
Charges for Services	31,199
Fires and Forfeits	17,607
Rents and Leases	22,589
Miscellaneous Revenue	44,720
Transfers from Other Funds	94,143
TOTAL REVENUES	$2,167,653

Expenditures	Expenditures
General Government	$ 637,429
Public Safety	863,399
Public Works	570,773
Parks and Recreation	96,052
Other	0
TOTAL EXPENDITURES	$2,167,653

Source: Alaska Consultants, Inc., 1980. Table 57, p. 167.

of revenues whild fees, licenses, and other miscellaneous sources provided 7.7 percent. Kenai obtained only 23.6 percent or less than a quarter of its operating revenues from intergovernmental transfers.

Property tax rates in the city of Kenai rose sharply between 1972 and 1975, from 7 to 16.75 mils, but have since declined slightly. The 1978 mil rate of 13.4 was about average for Kenai over this recent period and was in the middle of the range for cities in the Kenai Peninsula Borough. In additon to the city mil levy, the Kenai Peninsula Borough also assesses a 4.7 mil tax in the city for school support (4.035 mils), borough administration (0.465 mils), and hospitals (0.2 mils). It should be noted that boroughwide administration of the local public education system relieves the city of direct responsibility for one of the major fiscal and service burdens of local government. The city sales tax levy was 3 percent in 1978, with an added 2 percent collected by the borough and allocated to school support (table III.C.2.c.-7).

In the broad picture of local government finance in the Kenai Peninsula Borough, the city of Kenai is adversely affected by the peculiar geography of residents and high value properties in the Kenai-north Kenai area. Kenai is the largest city in the borough, in part because of its function as a bedroom community for employees of the industrial plants in the Nikiski area. However, its real property tax base consists mostly of relatively low-valued residential, commercial, and light industrial properties. Kenai is home to roughly 20 percent of the borough's residents but only about 7 percent of its property tax base. On the other hand, the less populous but heavily industrialized Nikiski-north Kenai area immediately adjacent to Kenai encompasses about 75 percent of the borough tax base, a difference of tenfold over the city of Kenai. In effect, the city of Kenai supports city services for residents who commute to the Nikiski industrial plants, but it does not have tax access to the property tax base of the firms which benefit from Kenai's role as a residential community. In years past, the city of Kenai has pursued changes in State statutes which would entitle it to a share of property tax income from the nearby highly capitalized industrial plants, but its efforts have not yet met with success.

Despite the city's above-noted imbalance of service burdens and revenue potential, the city of Kenai's general financial condition seems to have improved in the past few years. Mil rates, per capita debt, and the ratio of debt to assessed valuation have all declined while assessed valuation has climbed.

d. Local Soldotna Economy:

Employment: A 1979 employment count (Alaska Consultants, Inc., 1980) totalled 361 government sector employees in Soldotna. This included 293 borough, school district, and city of Soldotna employees; 58 State employees, most of whom were associated with the Kenai Peninsula Community College; and 10 Federal Government employees. It is assumed that government employment was a slightly lower 350 in 1977. The government sector is the largest single employer in Soldotna and represents about one-quarter of all the city's employment. In this respect Soldotna is closer to statewide norms than either the Kenai-Cook Inlet Census Division or the Kenai labor area where construction was the dominant sector in 1977.

State Department of Labor data indicate that, next to government employment, Soldotna is most heavily dependent upon the trade and service sectors. In

Table III.C.2.c.-7
City of Kenai
Property and Sales Tax Rates
FY 1977 - FY 1978

	Property Tax (mils) 1977	1978
City of Kenai	15.00	13.400
Borough - Administration		0.465
Borough - Schools	5.00	4.035
Borough - Hospitals (South)	0.20	0.200
TOTAL	20.20	18.100

	Sales Tax (percent) 1977	1978
City of Kenai	4.00	3.00
Borough - Schools	2.00	2.00
TOTAL	6.00	5.00

Source: Alaska Consultants, Inc., 1980. Table 58, p. 168.

1977, the latest year for which complete data are available, trade (25.6%) and services (22.3%) accounted for 459 jobs or nearly half (47.9%) of insured employment. This is a much heavier concentration of employment in these two sectors than occurred in the state as a whole (33.9%) or the Kenai-Cook Inlet Census Division (25.6%) in 1977.

After government, trade, and services, most remaining employment in Soldotna is in transportation, communications and public utilities (20%), and construction (16.5%).

Recent Trends and Changes: The trend in employment in Soldotna during the past decade has been one of rapid growth. Employment rose from 374 in 1970 to 958 by 1977, an increase of 156 percent (table III.C.2.d.-1).

Due to non-disclosure regulations and changes in the reporting requirements for local government employment, published Department of Labor data do not fully reflect growth trends in the public sector. However, Department of Labor data, considered together with the 1978 Alaska Consultants, Inc. employment count, do support the conclusion that the government sector has grown to become the most important employer in Soldotna.

After government, the strongest growth occurred in the contract construction industry where employment expanded fivefold during the seven year period. Most of this growth took place from 1975 to 1977, concomitant with the Collier Carbon and Chemical Corporation's plant expansion and involved primarily residential development.

After construction, the most dynamic element of Soldotna's economy was the service sector where employment more than tripled from 1970 to 1977. While some of this increase undoubtedly resulted from tourism, it also reflects the growing importance of Soldotna as a regional service center.

Because of disclosure regulations, data on employment in the transportation, communications, and public utilities sector are not available for the early years of the decade. However, employment in this sector rose from 62 in 1972 to 192 in 1977, an increase of 210 percent.

Discounting borough employees, Soldotna labor area employment appears to have undergone modest growth during the first three quarters of 1978, despite the decline in employment in the region as a whole during this period. Although employment in the construction and transportation, communications and public utilities sectors declined, gains in all other sectors of the economy, most notably in trade and services, more than made up for the loss.

Income Levels: Soldotna households enjoy higher incomes than those in most other Kenai Peninsula Borough communities. A survey conducted by the Anchorage Urban Observatory found that of the five major cities (Soldotna, Kenai, Seldovia, Homer, and Seward) in the borough, city of Soldotna households had a mean income of $29,659 in 1975, second only to Kenai. For the larger Soldotna area (including Sports Lake and Big Eddy Road), mean household incomes were a somewhat higher $30,870, but were still slightly lower than those in Kenai.

Local Government Finances: In order to evaluate the fiscal condition of the city of Soldotna, the most recent city financial statement for the fiscal year

Table III.C.2.d.-1
Nonagricultural Wage and Salary Employment Distribution
Soldotna Labor Area
1970-1977

	1970		1977		1970-1977
	Number	%	Number	%	% Change
Agriculture, Forestry, and Fisheries	0		0		
Mining	31	8.3	51	5.3	64.5
Contract Construction	23	6.1	158	16.5	587.0
Manufacturing	*/		*/		
Transportation, Communications and Public Utilities	*/		192	20.0	
Trade	135	36.1	245	28.6	81.5
Finance, Insurance, and Real Estate	*/		42	4.4	
Service	48	12.8	214	82.3	345.8
Miscellaneous	0		*/		
Government	17	4.5	*/		
Federal	(*/)		(*/)		
State & Local	(*/)		(*/)		
TOTAL	374	100.0	958	100.0	156.1

*/ Employment figures withheld to comply with disclosure regulations.

Source: Alaska Consultants, Inc., 1980. p. 184.

ending June 30, 1978, was reviewed, along with data on assessed valuations, municipal debt and real property, and sales tax rates published by the State Assessor's Office.

A review of the full value of property, as determined by the State Assessor (Alaska Taxable), within Soldotna's corporate limits from 1969 through 1978 was undertaken (table III.C.2.d.-2). According to the State Assessor's records, the full value of property in Soldotna increased by about 414 percent during this period, with most of the increase occurring since 1976. This was a more rapid rate of growth than was experienced in other incorporated communities in the borough with the exception of Homer. However, the full value of property in the borough as a whole increased at a faster rate than in Soldotna during the same period, with the largest share of growth in valuation taking place outside the borough's incorporated communities, primarily due to oil and gas-related construction activity in the north Kenai area.

Total general fund revenues for Soldotna in FY 1978 amounted to $1,605,664. Of this, almost 60 percent was derived from property and local sales taxes. State revenue sharing funds were also significant, accounting for about 8 percent of Soldotna's general fund revenues in FY 1978.

The city's general fund expenditures in FY 1978 amounted to $1,365,716, or about $575 per capita. The major category of expense was the Police Department which accounted for 20.6 percent of general fund expenditures followed by administration (14.1%), streets and roads (10.8%), the city shop (9.5%), and the fire department (9.2%) (table III.C.2.d.-3).

A review of Soldotna's overall financial condition indicates that the city's financial position is basically sound but, in order to maintain this position, Soldotna residents have had to pay relatively high property and sales taxes. In the Kenai-Soldotna area, this is due in large part to the location of the Nikiski industrial area in north Kenai, outside the corporate limits of these communities although many workers live in either Kenai or Soldotna and use municipal facilities and services.

According to the State Assessor's records, Soldotna's per capita valuation was $28,965 per capita in FY 1978 (table III.C.2.d.-4). This was well below the statewide per capita valuation of $50,398 for that year. However, the statewide average was seriously distorted by the inclusion of the trans-Alaska pipeline and related taxable real property and Soldotna's per capita valuation exceeded that of most Alaska communities of a similar size.

As reported by the State Assessor, the city of Soldotna had an outstanding general obligation bonded indebtedness of $1,579,000 as of June 1978 (table III.C.2.d.-4). Nearly all of this debt is serviced through various special assessment funds established for specific public improvements rather than through general property tax revenues or general fund expenditures. The direct per capita debt averaged $668, which was well below the statewide municipal average ($1,421) but slightly above the average used by Moody's Investors Services. Not included in Soldotna's direct debt, however, is its share of the Kenai Peninsula Borough's general bonded indebtedness. Using a prorated share of the Kenai Peninsula Borough's general bonded debt based on the city of Soldotna's accounting for 4.4 percent of the borough's 1978 full value determination, a $2,135,398 indirect debt has been added to the city's

Table III.C.2.d.-2
City of Soldotna
Comparison of Full Value Determination
1970 - 1978
(in $000's to nearest $1,000)

Year	Full Value Determination
1969	$13,330
1970	$14,217
1971	$14,761
1972	$16,495
1973	$18,085
1974	$19,658
1975	$22,841
1976	$30,948
1977	$43,356
1978	$68,502

Source: Alaska Consultants, Inc., 1980. Table 74, p. 228.

Table III.C.2.d.-3
General Fund
Statement of Revenues and Expenditures
City of Soldotna
Year Ended June 30, 1978

Revenues	Revenues Actual
Property Tax	$ 459,801
Sales Taxes	488,415
Franchises	6,409
Licenses and Building Permits	37,451
Airport Income	18,867
Shared Revenue - State	131,472
Anit-recessionary	63,129
Transfer from Federal Revenue Sharing Fund	53,250
Business Licenses	89,580
Liquor Licenses	4,875
Telephone and Electric Cooperative	10,799
Amusement Devices	714
Fines	9,858
Park Fees	5,881
Charges for Services	12,407
Rental of Municipal Property	18,053
Shop Revenue and Equipment Rental	73,148
Motor Vehicle License Commission	23,058
Dispatch Revenue	20,700
Interest Earned	19,197
Sale of Municipal Property	5,735
Airport Gas Tax	3,248
Bureau of Outdoor Recreation	
Animal Control	1,182
CETA	17,636
Transfer from Capital Projects	25,495
Miscellaneous Revenue	5,304
TOTAL REVENUES	$ 1,605,664

Source: Alaska Consultants, Inc., 1980. Table 76, p. 232.

Table III.C.2.d.-4
Indicators of Financial Condition
City of Soldotna, Alaska
FY 1978

Population[1/]	2,365		
Full Value Determination		$68,502,128.00	
Full Value Per Capita		$ 28,965.00	
General Obligation Debt		$ 1,579,000.00	
Total Debt[2/]		$ 3,714,398.00	
Per Capita Debt			
General Obligation		$ 668.00	
Total		$ 1,571.00	
Debt as Percent of Full Value			
General Obligation			2.31%
Total			5.42%

Guidelines for Per Capita Debt

Direct	$	618.48
Overall	$	733.93
Percent of Full Value[3/]		5.50%

1/ Soldotna's July 1977 population as accepted by the Department of Community and Regional Affairs for State Revenue Sharing Purposes.

2/ Total debt equals Soldotna's G.O. bonded debt plus a prorated share ($2,135,398) of the Kenai Peninsula Borough's G.O. bonded debt based on the city of Soldotna's accounting for 4.4 percent of the borough's 1978 full value determination.

3/ Median value for selected places of under 10,000 population used by Moody's Investors Services, Inc.

Source: Alaska Consultants, Inc., 1980. Table 77, p. 234.

general bonded debt to arrive at a total debt of $3,714,398. This total debt figure translates into a much larger per capita debt of $1,571 which is above the 1978 statewide municipal average and significantly exceeds the guidelines used by Moody's Investors Services. It also exceeds that of all other Kenai Peninsula Borough communities except Homer. Nevertheless, Soldotna's overall debt in terms of percentage of full value (5.4%) is within Moody's Investors Services' recommended guidelines (5.5%).

e. Local Homer Economy:

Composition of Employment: The 1978 Special Census counted 2,054 residents in the city of Homer. Another 3,027 persons lived at Anchor Point, Diamond Ridge, Fritz Creek, and Kachemak, which comprise the rest of the Homer labor area. Thus, nearly 60 percent of the residents of the Homer labor area appear to live in the surrounding area outside the city of Homer proper. Still, Homer itself is the focus of most employment in this area and, therefore, it is assumed that labor area data area fairly representative of Homer's own employment structure.

A field survey found that the fishing industry was the largest single employer here in 1979 (Alaska Consultants, Inc., 1980). Commercial fishing accounted for about 400 direct jobs or about one-quarter of the total of 1,621 jobs tallied. Since the Homer-based fishery is essentially an export industry sending its products outside the region, nearly all fishermen can be considered basic workers, making the fishing industry the source of nearly half of all basic employment.

This survey's count of the number of fishermen in the Homer area was checked against permit application data compiled by the Commercial Fisheries Entry Commission. In 1975, Commission records show that 196 permit applicants had a Homer mailing address and another 95 had an Anchor Point address. If allowance is made for a likely excess in the actual number of fishermen over the number of gear permits issued, this measure of fishing employment is broadly consistent with the results of the 1979 field survey.

Department of Labor employment data indicate that, omitting direct employment in the fishing industry, the Homer area is heavily dependent upon the trade and service sectors for employment. In 1977, the most recent year for which complete data are available, trade (21.9%) and services (14.4%) together accounted for 267 jobs or better than one-third of insured employment. In part, this reflects the strong contribution of the tourism and recreation industry to Homer's economy. For example, the Alaska Consultants, Inc. survey found that between a quarter and a third of trade and service jobs were basic, catering to tourists and other visitors rather than to strictly local markets.

The industrial sector of transportation, communications, and public utilities were reportedly the largest single category of insured employment (table III.C.2.e.-1), with 162 workers or 22.0 percent of the total. The public sector employed about 14.1 percent of the workforce, while the construction industry, a major employer in the Kenai area of the borough, engaged a relatively small share (9.9%) of Homer's workforce. Because of disclosure restrictions, an exact tabulation of manufacturing employment is not available, but it is estimated at about 10 percent of total employment, most of it in the fish and shellfish processing industry. These manufacturing jobs and other

Table III.C.2.e.-1
Nonagricultural Wage and Salary Employment Distribution
Homer Labor Area 1/
1970-1977

	1970		1970-1977
	Number	%	% Change
Agriculture, Forestry, and Fisheries	2/		
Mining	2/		
Contract Construction	2/		
Manufacturing	2/		
Transportation, Communications and Public Utilities	98	22.8	74.2
Trade	40	9.6	300.0
Finance, Insurance, and Real Estate	17	4.1	105.8
Service	44	10.6	140.9
Miscellaneous	0		
Government	45	10.8	131.1
Federal	(2/)		
State & Local	(2/)		
TOTAL	417	100.0	76.3

1/ Includes Anchor Point, Diamond Ridge, Fritz Creek, and Kachemak.
2/ Employment figures withheld to comply with disclosure regulations.

Source: Alaska Consultants, Inc., 1980. Table 81, p. 246.

secondary employment engendered by the fishing industry should be considered in weighing the full economic importance of the fisheries industry to Homer.

The trend for Homer's economy in the current decade has been expansionist. Employment has grown from 417 in 1970 to 735 as of 1977, an increase of 76 percent. The most dynamic elements of the economy have been those sectors oriented to the visitor industries. Thus, between 1970 and 1977, employment in trade tripled and service employment increased by 140 percent, in each case a rate of growth well above the overall rate for Homer's economy.

However, local impressions and interviews indicate that the summer of 1979 is expected to bring a temporary reversal in this growth trend. The vitality of Homer's visitor industry is closely tied to the growth and prosperity of the Anchorage area it largely serves and the current post-pipeline economic deceleration in the Anchorage area will likely be reflected in this sector of Homer's economy.

On the other hand, the fishing and fish processing industry appears to have consolidated and stabilized its role in Homer's economy. This has come about through improvements in the management regime for fisheries, added investment in the fish processing industry and the Homer-based fishing fleet, and better fleet services. It appears likely that continuing efforts to improve port facilities and to develop and explore the groundfish resources of the region will further enhance the economic development of Homer's fisheries industry.

Income Levels: The most pertinent data for estimating incomes at Homer is the income data previously cited for the Kenai-Cook Inlet region as a whole. According to the Alaska Department of Labor, the average wage in the Kenai-Cook Inlet region in 1977 was $23,386, nearly 10 percent above the statewide average. Other things being equal, Homer wage earners would, by inference, also have above average earnings. While there is no specific income data to support a different conclusion, there are circumstantial factors which suggest that Homer incomes may be somewhat below regional averages. This hypothesis is based on the composition of employment at Homer. There are relatively few jobs in construction and mining, the two best paying sectors (table III.C.2.e.-2). On the other hand, a disproportionate share of Homer's employment is concentrated in trade and services and fish processing, each of which tends to pay low average wages on a seasonal basis.

Data on income assistance program disbursements reveal that the financial assistance distributed through such programs in Homer is not large.

Local Government Finances: In order to evaluate the fiscal condition of the city of Homer, the most recent city financial statement for the fiscal year ending June 30, 1978, was reviewed, along with data on assessed valuations, municipal debt and real property and sales tax rates published by the State Assessor's Office.

As of 1978, Homer's assessed valuation per capital stood at $32,553 (table III.C.2.e.-3). This was well below the statewide per capita valuation of $50,398 for that year. However, the statewide average is seriously distorted by the inclusion of the trans-Alaska pipeline and related taxable real property. If the pipeline-related property tax base is omitted, then the resulting average statewide per capita figure would approximate Homer's per capita valuation.

Table III.C.2.e.-2
Average Annual Full-Time Employment [1/]
Homer Labor Area [2/]
1979

Industry Classification	Number	Percent	% Basic	Basic Number	Secondary Number
Agriculture, Forestry, and Fishing	400[3/]	24.7	98	392	8
Mining	0[4/]	0.0	--	0	0
Contract Construction	49	3.0	12	6	43
Manufacturing	151	9.3	95	143	8
Transportation, Communication, & Public Utilities	139	8.6	46	64	75
Trade	311	19.2	37	115	196
Finance, Insurance, and Real Estate	77	4.7	31	24	53
Service	198	12.2	24	53	145
Government	296	18.3	42	125	171
Federal	(78)	(4.8)	(80)	(62)	(16)
State	(71)	(4.4)	(48)	(34)	(37)
Local	(147)	(9.1)	(20)	(29)	(118)
TOTAL	1,621	100.0	57	922	699

1/ Includes self-employed and military personnel.
2/ The Homer labor area is defined as the Homer Precinct, Anchor Point, Fritz Creek, Diamond Ridge, and Kachemak.
3/ Number of fishermen employed on an average annual year-round basis estimated by using yearly registration data, length of fishing season, and normal "crew" sizes for various types of fishing vessels.
4/ Minor employment in sand and gravel considered with contract construction and transportation.

Source: Alaska Consultants, Inc., 1980. Table 7, p. 31.

Table III.C.2.e.-3
Indicators of Financial Condition
City of Homer, Alaska
FY 1978

Population	2,055[1/]
Full Value Determination	$66,896,480.00
Full Value Per Capita	$ 32,553.00
General Obligation Debt	$ 2,357,812.00
Total Debt[2/]	$ 4,444,678.00
Per Capita Debt	
General Obligation	$ 1,147.00
Total	$ 2,163.00
Debt as Percent of Full Value	
General Obligation	3.52%
Total	6.64%
Guidelines for Per Capita Debt	
Direct	$ 618.48
Overall	$ 733.93
Percent of Full Value[3/]	5.50%

1/ Homer's July 1977 population as accepted by the Department of Community and Regional Affairs for State Revenue Sharing Purposes.

2/ Total debt equals Homer's G.O. bonded debt plus a pro-rated share ($2,086,866) of the Kenai Peninsula Borough's G.O. bonded debt based on the city of Homer's accounting for 4.3 percent of the borough's 1978 full value determination.

3/ Median value for selected places of under 10,000 population used by Moody's Investors Services, Inc.

Sources: Alaska Consultants, Inc., 1980. Table 98, p. 311.

An examination of the trend in Homer's equalized assessed valuation over the past decade shows that the assessed value of Homer's real property tax base has risen from $10,913,000 in 1960 to $66,896,000 by 1978, an increase of 513 percent. The great bulk of this increase accrued in the last 3 years, coincident with the spurt of economic and population growth which Homer experienced during this period. Those years were also a time of rapid inflation in property values (table III.C.2.e.-4).

The city of Homer's debt situation as of June 30, 1978 included $2,348,000 in outstanding general obligation bonds for water and sewer improvements and for the recently built public safety building and $1,168,000 in revenue bonds for water utility improvements and port facilities. (Table III.C.2.e.-5 does not reflect the full amount of the city's bonded debt because the 1970 sewer general obligation bonds are recorded in the Sewer Utility Fund and are being repaid from sewer special assessments.) This debt does not consider the burden on Homer's taxpayers of their share of the Kenai Peninsula Borough's general obligation indebtedness. If a portion of the borough's debt is apportioned to the city of Homer based on its prorated share of the borough's assessed valuation, then another $2,086,866 in debt can be tallied against the city of Homer's property tax base.

Compared to other small cities across the nation, Homer's ratio of direct general obligation bonded debt to its assessed valuation is 3.52 percent which compares favorably with the median value of 5.5 percent reported by Moody's Investors Service, Inc. for selected cities under 10,000 population. However, if Homer's share of the borough's debt is included, the city has a less favorable 6.64 percent ratio of bonded debt to local assessed valuation. Nevertheless, the city's overall financial position has improved measureably in the last couple of years due to increases in assessed valuations and to retirement of a portion of the city's outstanding bonds.

The greater part of the city of Homer's direct debt was incurred for bonds for water utility improvements and the public safety building. These bonds are being retired by means of a city sales tax levied and pledged for those projects.

City general fund expenditures in 1978 totalled $1,048,415. The most heavily supported local government functions were police protection ($263,997), general government administration $168,630) and public works administration ($167,687) (table III.C.2.e.-6). These three functions absorbed well over half of the city's general fund budget. Not included in this account of general fund expenditures were a variety of other enterprise fund and debt service funds whose outlays were financed by special assessments, user charges, and other non-general fund sources.

The primary source of general fund revenues was property tax levies which yielded $500,758 or 55.1 percent of all general fund revenues. Intergovernmental revenues from the State and federal governments contributed another 36.2 percent, while miscellaneous fees, etc., provided the remainder.

The property tax rate for Homer in 1978 was 12 mils, a rate the city has maintained since 1972 except for 1975 when it rose to 14 mils (see table III.C.2.e.-7). This property tax rate is slightly lower than the average for the four other major settlements in the borough where 1978 rates ranged from a low of 11.0 mils at Soldotna to a high of 16.5 mils at Seldovia. Above the

Table III.C.2.e.-4
City of Homer
Comparison of Full Value Determination
1969 - 1978
(in $000's to nearest $1,000)

Year	Full Value Determination
1969	$10,913
1970	$11,450
1971	$12,969
1972	$12,552
1973	$17,616
1974	$22,789
1975	$25,406
1976	$32,129
1977	$42,918
1978	$66,896

Source: Alaska Consultants, Inc., 1980. Table 99, p. 312.

Table III.C.2.e.-5
City of Homer
General Bonded Debt
Schedule of Debt Service Requirements to Maturity
JUNE 30, 1978

Fiscal Year	Principal	Interest	Total Annual Requirement
1979	$ 54,000	$ 90,124	$ 144,124
1980	60,000	86,488	146,488
1985	84,000	68,156	152,156
1990	43,000	52,701	95,701
1995	52,000	52,570	94,570
2000	30,000	33,750	63,750

Source: Alaska Consultants, Inc., 1980. Table 100, p. 313.

Table III.C.2.e.-6
General Fund
Statement of Revenues and Expenditures
City of Homer
Year Ended June 30, 1978

Revenues	Revenues Actual
General Property Taxes	$ 507,516
Less: Uncollectable Taxes	(11,389)
Total Taxes	496,127
Penalties and Interest on Taxes	4,631
	500,758
State of Alaska:	
Shared Revenue:	
Public Utilities	14,459
Business License	62,044
Alcohol Beverage Licenses	12,600
Gaming Devices	706
Fish Tax	6,475
Shared Revenue	74,775
Other Appropriations:	
Roads and Trails	10,889
Street Signs	4,445
Other	4,117
	190,510
Grants and Interfund Transfers:	
CETA Program Grant	113,013
Interfund Transfers:	
Anti-recession Funds	7,992
Federal Shared Revenue	--
Public Works Services	17,546
	138,551
Other Revenue:	
Public Safety Building Use/Services:	
Rent Revenue	2,210
Dispatcher Services	19,250
Other Services	4,200
Municipal Fees:	
Permits and Licenses	1,808
Fines and Forfeitures	9,730
Animal Licenses	2,475

Source: Alaska Consultants, Inc., 1980. Table 101, p. 316.

Table III.C.2.e.-7
City of Homer
Property and Sales Tax Rates
1972 - 1978

	Property Tax (mills) 1972	1978
City of Homer	12.00	12.000
Borough - Administration		0.465
Borough - Schools	5.00	4.035
Borough - Hospitals (South)		2.000
TOTAL	17.00	18.500

	Sales Tax (percent) 1972	1978
City of Homer		3.00
Borough - Schools	3.00	2.00
TOTAL	3.00	5.00

Source: Alaska Consultants, Inc., 1980. Table 102, p. 318.

local city property tax, Homer real property owners are also assessed an additional 6.5 mils by the Kenai Peninsula Borough for purposes of school support (4.035 mils), hospitals (2.0 mils), and borough administration (0.465 mils).

Homer residents also pay a 5-percent sales tax composed of a 3-percent city sales tax earmarked for debt service and a 2-percent borough sales tax allotted to finance the school system.

Overall, the city of Homer appears to be in generally sound fiscal health, especially with the improvement shown in its debt situation in the last few years. Assessed valuations are about average for Alaska municipalities and property tax and sales tax rates are comparable to other cities in the region, although they are above State averages.

3. Cultural Resources: Refer to the back of graphics 13 through 16.

4. Visual, Wilderness, and Recreation Resources: Refer to the back of graphics 13 through 16.

5. Land Status and Land Use:

a. Land Status: Land ownership patterns in the uplands and coastal areas near the proposed sale area are complex and changing. More than 90 percent of the land is in public ownership. The public ownership pattern is being determined by two major issues: Federal emergency actions under the Antiquities Act (16 USC 431; 43 FR 57009) and the Federal Land Management and Policy Act (FLMPA) of 1976 (43 USC 1714(e); PLO 5643, 5644; 43 FR 59756), and proposed Federal legislation variously referred to as "D-2," "National Interest Lands," or "Alaska Lands" legislation. Additionally, the prerogatives of the State of Alaska under the Alaska Statehood Act (PL 85-508), the indigenous peoples of Alaska under the Alaska Native Claims Settlement Act (ANCSA; 43 USC 1601); and local governments of Alaska under State Enabling Acts (AS 29.18; AS 38.04; Ch. 180-182, SLA 1978; Ch. 85 SLA 1979), complicate any mapped configuration of land ownership.

The following description of current land status references other detailed sources of land status information which are not presented in depth here (Environmental Consultants, 1979; DOI, BLM, 1979; DOI, 1979; Alaska DNR, 1979; U.S. House Committee on Interior and Insular Affairs, 1976). The land status description does not include the Shelikof Strait portion of the proposed sale area; this was presented in the DEIS on the now cancelled OCS sale 46-Western Gulf of Alaska (DOI, BLM, 1979). Graphic 16 depicts current land status with the degree of resolution possible at a scale of 1:3,000,000.

Federal Lands: Existing major Federal land holdings include the Kenai National Moose Range and the Chugach National Forest on the Kenai Peninsula. The Kenai National Moose Range (1,330,000 acres), and the Chugach National Forest (1,006,000 acres within the borough) occupy most of the Kenai Peninsula northwest and west of the Kenai Mountains.

On the west side of Cook Inlet, lies the Tuxedni National Wildlife Refuge (NWR) which is located on Chisik Island. This refuge functions to protect colonial nesting birds. On the Aleutian Range south of Kamishak Bay, lies the

Katmai National Monument, which is administered by the U.S. National Park Service (NPS). The existing portions of the monument include the coastline of the Shelikof Strait extending from Cape Douglas to Kashvik Bay.

Under authority of the Antiquities Act and FLMPA, the U.S. Administration created new land management designations for several major locations, either west of Cook Inlet, west of Shelikof Strait, or situated on the Kenai Peninsula. These lands were already in the public domain. Following is a listing of the new management units:

Monument Actions (16 USC 1431; 43 FR 57009)

Additions to the Katmai Monument: The monument is located on the interior of the Alaska Peninsula between Lake Iliamna and Lake Becharof. The monument is intended for national park and national wilderness designation, pending D-2 legislation.

Creation of a Becharof National Monument: This monument includes portions of the coastline of the Alaska Peninsula from Kashvik Bay in Shelikof Strait to Cape Igyak south of the strait. The monument is intended for a National Wildlife Refuge (NWR) designation, pending D-2 legislation.

Creation of a Lake Clark National Monument: The monument includes roughly 100 miles of the Chignik Mountains, west of Cook Inlet. Coastal portions of the monument extend from north of the Tuxedni Bay to south of Chinitna Bay. The monument is intended for national park designation, pending D-2 legislation.

Creation of a Kenai Fjords National Monument Along the Gulf of Alaska Side of the Kenai Peninsula: The monument comprises portions of the Kenai Mountains and extends to the coastline from Nuka Pass at its south, up to Resurrection Bay at the north. The monument is intended for national park designation, pending D-2 legislation.

FLPMA Withdrawals (43 USC 1714 (e); PLO 5653, 5654; 43 FR 58756)

Withdrawal of Lands in the Kenai Mountains and the Head of Kachemak Bay: This withdrawal is intended for NWR designation, pending D-2 legislation. Subsequent to the FLMPA section 204(e) withdrawal, the DOI created an NWR for this area under authority of FLMPA section 204(c) (43 USC 1714(c); PLO 5698; 45 FR 9578). This FLMPA withdrawal has a 30-year duration, but is likely to be changed under pending D-2 legislation. The Wildlife Refuge status in the area conflicts with some Native corporation and State land selections.

Withdrawal of Lands Surrounding Lake Iliamna in the Interior of the Aleutian Range: The withdrawal also includes the coastline of lower Cook Inlet from Iliamna Bay to Chinuna Bay. This area is also referred to as the Iniskin Peninsula. The withdrawal is intended for NWR designation, pending D-2 legislation (FWS, 1980). However, the Iniskin Peninsula portion of the withdrawal may be excluded from future NWR designation under pending D-2 legislation; the peninsula area has been the subject of Native corporation land selections under the terms of the Cook Inlet Exchange, and the peninsular ecosystem is different from that predominating in the FLMPA withdrawal.

Withdrawal of Unappropriated Islands, Rocks, Headlands, Spires, and Shoals Which are Significant for Marine Mammals and Migratory Water Fowl: The FLMPA withdrawal includes locations in Cook Inlet, Kamishak Bay, Shelikof Strait, and the Gulf of Alaska side of the Kenai Peninsula. The DOI more recently created a 30-year NWR for the withdrawn marine resources area under authority of FLMPA section 204(c)(43 USC 1714 (c); PLO 5710; 45 FR 9704). The withdrawal intended for an NWR designation under D-2 legislation.

State Lands

The State of Alaska has several major land holdings near the proposed sale area. It is additionally requesting lands due to it under provisions of the Statehood Act and the Cook Inlet Land Exchange. Refer to graphic 16 for identification of the State selected lands.

The Beluga River Drainage-Tyonek Area with 830,000 Acres: This area is rich in coal deposits, potential oil and gas reserves, and has timber-range land potential.

Kamishak Bay Area with 256,000 Acres: The State should receive additional acreage from the U.S. under terms of the Cook Inlet Land Exchange in this area. The Kamishak Bay area State land holdings include the McNeil River State Game Sanctuary.

Kenai Peninsula Lowlands with 541,000 Acres: This area includes most of the Kenai Peninsula to the west of the Kenai Moose Range boundary. The State ownership near the Sterling Highway corridor is limited, however.

Kenai Peninsula East of the Kachemak Bay with Some 320,000 Acres: The State land holdings are in State game, park, and critical habitat management units.

Kenai Peninsula-Diverse State Parks, Campgrounds, and Waysides with Some 33,000 Acres: These land management units are in several locations on the peninsula. Refer to section III.C.4. of this EIS regarding recreation, and graphic 15 which depicts recreational facilities and use areas on the Kenai Peninsula.

Much of the State lands within the Kenai Peninsula Borough boundaries, with the exception of the Tyonek-Beluga mineral lands, have been obtained to protect important fisheries, waterfowl, and big game habitat. Table III.C.5.a-1 lists the major State sanctuaries, refuges, and critical habitats in the Kenai Peninsula area. All of these areas include coastal lands and some of the habitat areas include tidelands or submerged lands. These areas are administered by the Department of Natural Resources (DNR), but management guidelines and development approval are provided by the Department of Fish and Game.

The State-owned lands in the Kenai Peninsula lowlands area have been the subject of study and planning by the Alaska DNR (Alaska DNR, 1979). In 1979, the State identified which of the vacant, unappropriated, and unreserved State lands should be retained in State ownership as "public interest" lands. The State identified these lands in response to competing claims on the Kenai Peninsula by the Cook Inlet Regional Corporation (CIRI), the Kenai Peninsula Borough, and individual cities.

Table III.C.5.a.-1
State Sanctuaries, Refuges, and Critical Habitats
in the Lower Cook Inlet Area

Location and Name	Approximate Acreage	Established to Protect and Perpetuate:
Existing		
McNeil River State Game Sanctuary	95,760	Brown bear and other big game
Trading Bay State Game Refuge	168,993	Waterfowl and big game habitat and hunting
Clam Gulch Critical Habitat	30,080	Razor clam habitat area
Fox River Flats Critical Habitat Area	6,720	Waterfowl habitat
Kachemak Bay Critical Habitat Area	215,000	Productive habitat for fisheries stocks, and spawning, rearing, and breeding for shellfish, crab, shrimp, and fish
Kalgin Island Critical Habitat Area	2,880	Unique tidal marsh used by migrating waterfowl
Proposed		
Redoubt Bay State Refuge	205,208	Waterfowl and big game habitat
Kamishak-Chinitna Bay Critical Habitat Area		Spawning, feeding, rearing, and breeding habitats for salmon and shellfish

The State selected approximately 100,000 acres of land from its unappropriated holdings of 416,000 acres. The public interest selections considered various resource management values; agriculture, recreation, scenic values, fish and wildlife habitat, extractive materials, forestry, and watershed. Figure III.C.5.a.-1 shows the location of the public interest lands to be retained in State ownership. The Alaska DNR is presently classifying these lands for appropriate uses and management.

Borough, City, and Private Lands: Nearly all of the current borough, city, and private lands (except Native corporation lands) in lower Cook Inlet near the proposed sale area are located on the Kenai Peninsula lowlands. The majority of these lands are located along the Sterling State Highway corridor from Homer to Soldotna, on the Kenai Spur Road from Kenai northward, and along the northern shores of Kachemak Bay. Most borough, city, and private lands are in close proximity (less than 10 mi) to the coastal waters of either Cook Inlet, Kachemak Bay, or Resurrection Bay. The borough, city, and private land holdings are in parcel sizes of one section (1 sq mi) or less in the Public Land Survey system. As such, detailed mapping of the configuration of borough, city, and privately held lands on graphic 16 is not possible.

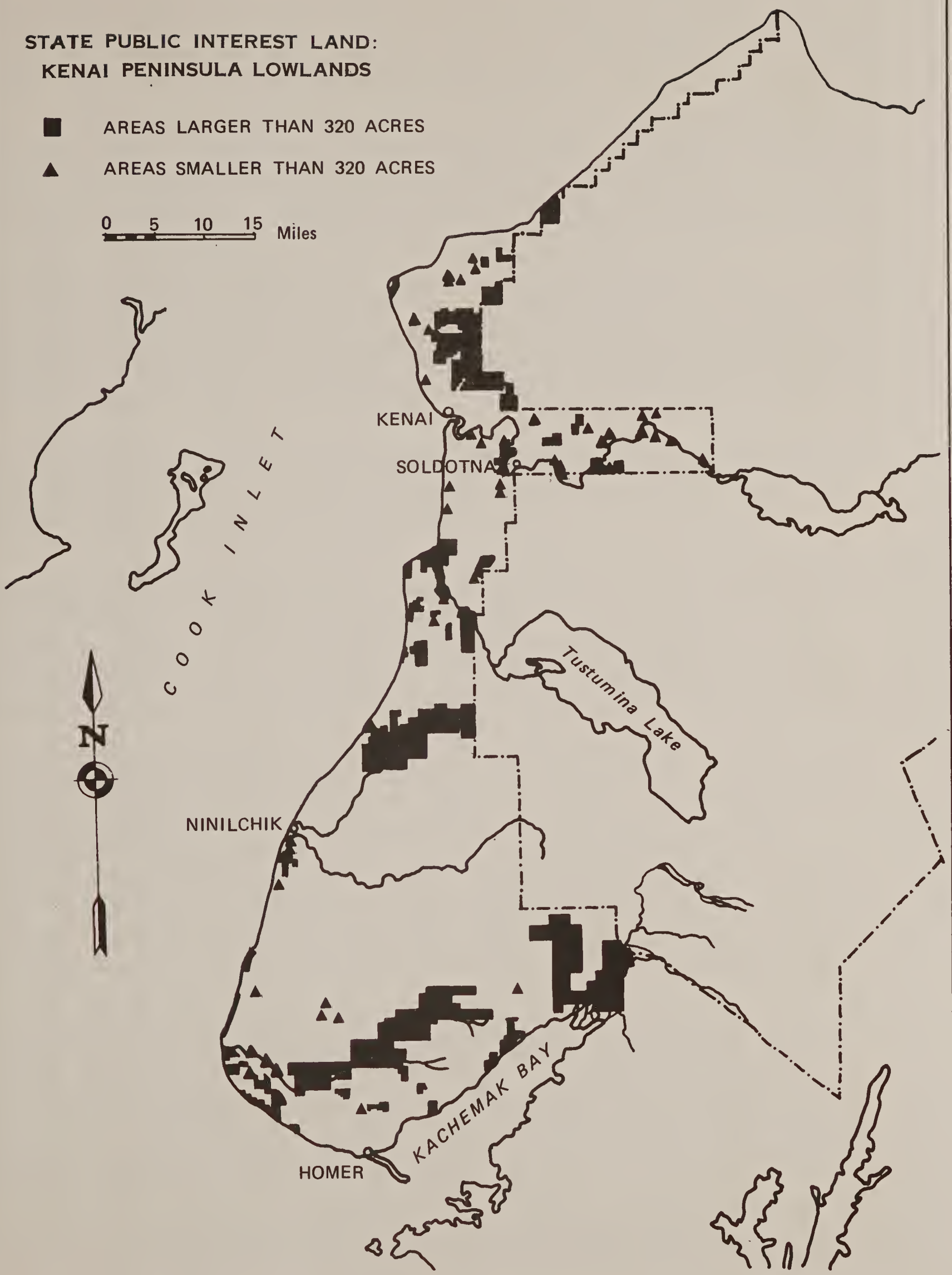
Native Corporation Lands: Under provisions of the Alaska Native Claims Settlement Act (ANCSA, 43 USC 1601, as amended), the indigenous Natives of Alaska are entitled to real property allotments among other provisions as a settlement for all aboriginal claims against the United States. The Act required Natives to create village and regional for-profit corporations in order to receive their land entitlements. In the proposed lease sale region, there are three regional Native corporations: the Cook Inlet Region, Inc. (CIRI), Koniag, and Chugach Natives, Inc. Refer to graphic 16 for delineation of ANCSA regional corporation boundaries.

ANCSA village corporations in the vicinity of the proposed lease sale include Ninilchik, Seldovia, Salamatof, Point Possession, English Bay, and Port Graham. Salamatof and Point Possession have yet to be certified as eligible villages under the enrollment procedures of ANCSA. The Native village of Tyonek is located on the west side of Cook Inlet in the Beluga area. Several Native village corporations are located on the Kodiak Archipelago, with some present in the Shelikof Strait. Refer to the DEIS on the now cancelled sale 46 for discussion of land status affected by the Shelikof Strait portion of proposed sale 60.

Graphic 16 depicts Native corporation lands as either selected, interim conveyed, or conflicting selections with the State of Alaska and/or its political subdivisions. Table III.C.5.a.-2 summarizes the land status in acreage amounts for the above-mentioned villages. The current land status of village corporations belonging to CIRI, as well as CIRI itself, is rather complicated. The villages and regional corporations were unable to procedurally satisfy their land entitlement options under terms of ANCSA because much of the land in the region was unavailable, already conveyed, or tentatively approved for conveyance to the State and its political subdivisions.

The Cook Inlet Land Exchange was authorized as an amendment to ANCSA which would make available satisfactory land allotments to village corporations and CIRI within the boundaries of CIRI itself (PL 94-456; U.S. House Committee on Interior and Insular Affairs, 1976). Under terms of the exchange, the State

FIGURE III. C. 5. a – 1



Source: State of Alaska, Department of Natural Resources, 1979

Table III.C.5.a.-2
Native Village Corporation Land Status in
Vicinity of Cook Inlet Area
(Acres)

Village	Land Entitlement[3]	Land Selection Outstanding[4]	Interim Conveyance	Patented Lands
Cook Inlet Region, Inc. (CIRI)				
Ninilchik	115,200	78,681	66,737	3,837
Seldovia	115,200	84,297	55,220	745
Tyonek	115,200	76,213	64,541	10
Salamatof[2]	92,160	NA	0	0
Pt. Possession[2]	69,120	NA	0	0
Chugach Natives, Inc.				
English Bay	74,369	85,267	44,702	0
Port Graham	106,205	177,350	65,832	12

NA = Not available

[1] Villages included in this table do not represent all Native village corporations within the boundaries of Cook Inlet Region, Inc., and Chugach Natives, Inc. Instead, the villages included represented those which are situated on or near the coastline of Cook Inlet and which are in the vicinity of the proposed lease sale area discussed in the DEIS on the now cancelled OCS sale 46 (DOI, BLM, 1979).

[2] The eligibility of the villages of Salamatof and Pt. Possession has yet to be determined under ANCSA provisions. The village of Pt. Possession has been determined to be ineligible but it is challenging this determination.

[3] Land entitlement represents the amount of acreage entitled to the villages under ANCSA provisions.

[4] Land selection outstanding represents the amount of acreage which the villages have selected, but which has yet to be disposed. Villages typically "overselect" the amount of acreage entitled to them. Hence, the sum of "Selections Outstanding," "Interim Conveyance," and "Patented Lands," will not equal "Land Entitlements."

has conveyed approximately 450,000 acres of land within the CIRI boundaries to the regional corporation. The lands conveyed come under selection "pools" located on the Kenai Peninsula lowlands (Kenai Pool), the Beluga area townships (Beluga Pool), and the Knik-Willow area (Knik Pool).

Under the exchange, 138,000 additional acres are authorized for CIRI selection from State lands. Some of these selections will occur in the CIRI boundaries, and other selections will be located in other parts of the State. In return for the State lands made available to the CIRI through the exchange, the State will receive from the U.S. equal acreages of land located in other regions of the State.

Village corporations affected by the Cook Inlet Land Exchange, and located in the coastal zone Cook Inlet area, will be entitled to roughly 262,000 acres of land. The village corporation involved includes Alexander Creek, Chickaloon, Knik, Ninilchik, Seldovia, Tyonek, and Salamatof. In the event that Salamatof and Alexander Creek are determined to be eligible under ANCSA provisions, they will participate in this entitlement.

Apart from the Cook Inlet land exchange, a major area of Native land selections outstanding is the Tuxedni-Iniskin area. CIRI has selected approximately 262,000 acres of land which would be reconveyed to village corporations to satisfy their entitlements under ANCSA.

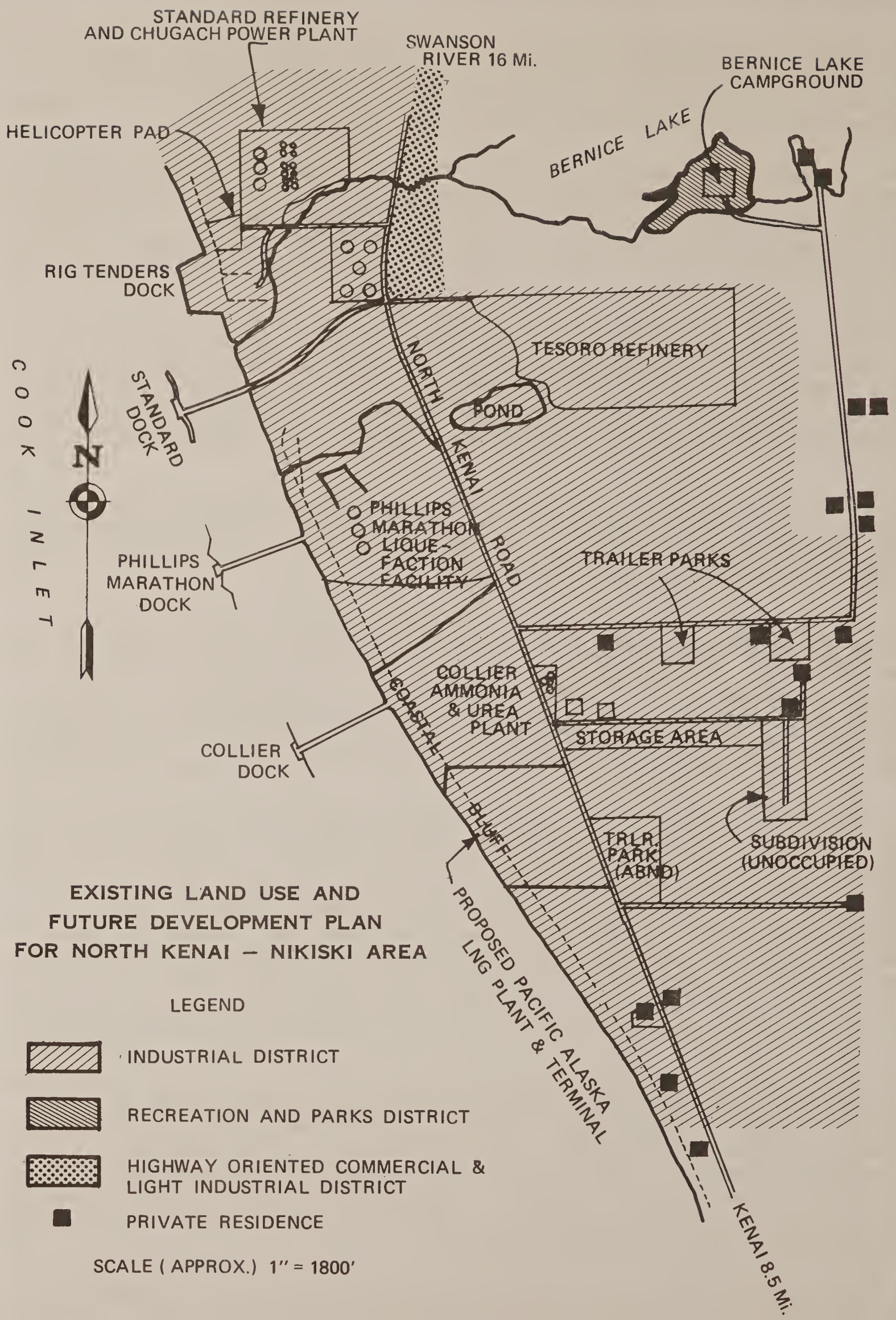
b. Existing Land Use: Developed land use in the Cook Inlet portion of the proposed sale area is located primarily on the lowlands of the Kenai Peninsula. Graphic 16 shows incorporated and unincorporated Kenai Peninsula communities and established settlements. Urban land use, i.e., residential, commercial, and industrial uses, are restricted to the communities identified as shown on graphic 16. Some limited agricultural land use occurs on large parcels on the Kenai lowlands near the Sterling Highway corridor.

Oil and gas development occurs on the Kenai Peninsula and in the territorial waters of upper Cook Inlet. The Swanson River oilfield is located within the Kenai National Moose Range boundaries northeast of Kenai. Offshore producing oilfields also exist in the territorial waters of Cook Inlet at the Middle Ground Shoal area and offshore between west Foreland and Granite Point. Producing gas fields are present in upper Cook Inlet and in specific points along the Kenai Peninsula: Kenai, Beaver Creek Inlet, False Creek, and Anchor Point. Industrial facilities serving the known Cook Inlet hydrocarbon fields are located in the coastal area of Nikiski and north Kenai. Refer to figure III.C.5.b.-1 for a depiction of these facilities and the adjacent land uses.

On the west side of Cook Inlet, developed land uses are restricted to oil and gas onshore facilities at Drift River and Trading Bay and a Native village located at Tyonek. Other Native villages exist at the head of the inlet in the Knik Arm area; however, this area is beyond an area of consideration for the proposed lease sale. The Tyonek-Beluga townships area is proposed for extensive coal development although no extraction is occurring there presently (Placer Amex, Inc., 1977; DOE, 1979). Refer to section IV.A.2.h. of this DEIS regarding other major development actions.

The developed land uses in the Shelikof Strait portion of the proposed sale area are restricted to Native village settlements and fishing camps. Graphic 16

FIGURE III. C.5. b – 1



EXISTING LAND USE AND FUTURE DEVELOPMENT PLAN FOR NORTH KENAI – NIKISKI AREA

LEGEND

- INDUSTRIAL DISTRICT
- RECREATION AND PARKS DISTRICT
- HIGHWAY ORIENTED COMMERCIAL & LIGHT INDUSTRIAL DISTRICT
- PRIVATE RESIDENCE

SCALE (APPROX.) 1" = 1800'

Source: Alaska State Housing Authority, 1970; Dames & Moore, 1979

depicts the location of these villages. Refer to sections III.C.1.b. and III.C.1.d. regarding local infrastructure and subsistence for further discussion of these villages and settlements.

Aside from settlements in the coastal zone of the proposed sale area, land uses are restricted to resource conservation and recreational utilization generally. Much of the coastal and uplands terrain surrounding Cook Inlet is in Federally managed National Wildlife Refuges, National Monuments, and National Resource areas. Refer to III.C.5.a. regarding land status. Graphic 16 depicts these management units for their coastal boundaries. Refer also to graphic 15 and section III.C.4. on recreation, visual, and wilderness resources regarding these management units.

The management status and land use activities allowed on these Federal units is summarized below with the exception of that portion of the Katmai National Monument which existed before the 1978 enlargement, and the Kenai National Moose Range. These management units have authorized master plans which are discussed below in III.C.5.c.

Enlargement of the Katmai National Monument: The addition to the national monument created by executive proclamation of 1978 has been the subject of emergency regulations of the National Park Service (NPS) (36 CFR 1.2(g), 7.87; 43 FR 60254). The NPS has proposed general management regulations for the monument additions (36 CFR Part 13 (new); 44 FR 37732). However, permanent regulations have yet to be adopted. The monument enlargement, as well as the existing monument, are proposed as a national park under pending D-2 legislation.

Lake Clark National Monument, Kenai Fjords National Monument: These monuments were created by executive proclamation of 1978 (43 FR 57079; 43 FR 57067). They are presently being managed by the NPS pending D-2 legislation. The monuments are managed under the same regulations mentioned above pertaining to the enlargement of the Katmai National Monument. The interim emergency regulations issued for the NPS-managed monuments are different from the NPS management objectives and requirements for parklands throughout the United States. These regulations will allow land uses of non-motorized recreation, subsistence hunting, fishing and trapping, sportfishing, firearms possession and use, and limited forms of motorized access. Sport hunting, siting of permanent structures, and new mining claims are prohibited land uses of monument lands. Existing mining claims in the newly created monuments are subject of the Mining in the Parks Law (PL 94-429).

Becharof National Wildlife Monument: This new monument was created by presidential proclamation and is presently being managed by the FWS (43 FR 57025). Interim emergency regulations were issued by the FWS (44 FR 60257), and general management regulations have been proposed (50 CFR Subchapter H: Parts 96-107 (new); 44 FR 37755). Land uses allowed in the Becharof National Wildlife Monument are similar to those allowed in the Kenai National Moose Range. Refer to section III.C.5.c.

FLMPA Withdrawals: Kenai Fjords and Alaska Marine Resources Refuges: These areas are managed by the FWS under existing general management regulations of the National Wildlife Refuge System (50 CFR Subchapter C: Part 25).

The FWS intends to issue interim regulations on these lands which would generally keep them open to public access. Land uses allowed would be similar to those allowed on the Kenai National Moose Range. Refer to section III.5.c. regarding the Kenai National Moose Range.

c. Approved Land Use Master Plans: Because land use is considered to be a significant issue in this DEIS, and recognizing the CEQ guidance on consideration of approved plans of general purpose governments (40 CFR 1502.16(c), 1506.2(d)), this section briefly summarizes the provisions of applicable plans in the lease sale area. In all instances, these plans are approved by the local government or Federal agency involved. Other local communities, either on the Kodiak Archipelago, Kenai Peninsula, or the upper Cook Inlet have adopted plans. However, these areas would not be affected by the leasing proposal, and hence are excluded here.

Kenai Peninsula Borough-Unincorporated Central Peninsula: For the unincorporated areas of the borough, the borough uses as planning guidance "Comprehensive Planning Program Recommendations" (Alaska State Housing Authority, 1970), and "Comprehensive Plan Goals and Objectives" (Kenai Peninsula Borough, 1973). The area studied in the Comprehensive Planning Program extended from Kasilof-Clam Gulch on the south to Nikiski-Nikishka Bay on the north.

The 1970 plan recognized the role of hydrocarbon extraction and petroleum industry operations in preparing for future land use and development. The plan stated that future petroleum industry operations, within the analysis area mentioned above, should be concentrated in the north Kenai/Nikiski area. The plan sets aside for industrial land use at least 25 square miles of lands with 12 miles of coastal shoreline in the Nikiski area. This is the location of the existing oil and gas facilities and terminals. Refer to figure III.C.5.b.-1 for a depiction of the existing facilities in the Nikiski area.

The borough's 1970 plan also recognizes the possibility of oil and gas development in lower Cook Inlet, but the borough chose not to plan for the onshore manifestations:

> "Over the long run, anticipation of future [hydrocarbon] production assumptions adopted in this plan are that the petrochemical industry based in the Cook Inlet basin would continue to expand its level of operations although at a pace slower than that of the past decade.... The next stage of petroleum development is likely to occur offshore in the lower Cook Inlet basin, southwest of Kalgin Island.... It is unsettled to what extent development of the lower Cook Inlet basins will rely on support services and facilities already existing in the [Nikiski-Kenai-Soldotna] area, and to what new support services and facilities would be needed in the southwestern part of the peninsula area of Homer.... When it is clear that new petroleum developments are impending, the affected communities together with the borough government should be prepared to guide development and its consequences in an orderly manner and to the benefit to the communities and the borough (Alaska State Housing Authority, 1970)."

The policies of the 1970 plan for the unincorporated central peninsula region could be summarized as follows: Low density rural residential development is desirable in locations with existing road access and development. Rural residential development is planned along the Sterling Highway from Cohoe Lake and

Kasilof up to Soldotna and along the Kenai Spur Road up to Daniels Lake, approximately. Rural residential development would receive only limited public services and utilities.

Urban residential development would be concentrated in the incorporated communities of Soldotna and Kenai with a small urban area at Nikishka Station Number 2.

Commercial development should be concentrated in areas of convenience to users; random strip commercial development along the Sterling Highway network is discouraged. Necessary highway-oriented commercial uses would be allowed.

Industrial development should be concentrated in the existing north Kenai-Nikiski area which has clearly become the industrial center of the region (see discussion above regarding oil and gas facilities).

Agricultural land use should be encouraged on lands with prime soils and on lands with large parcel ownership.

Figure III.C.5.c.-1 shows the planned land use for the unincorporated central peninsula borough. Figure III.C.5.b.-1 overlays the borough plan land use designations in the north Kenai-Nikiski area on the existing industrial land uses of that area.

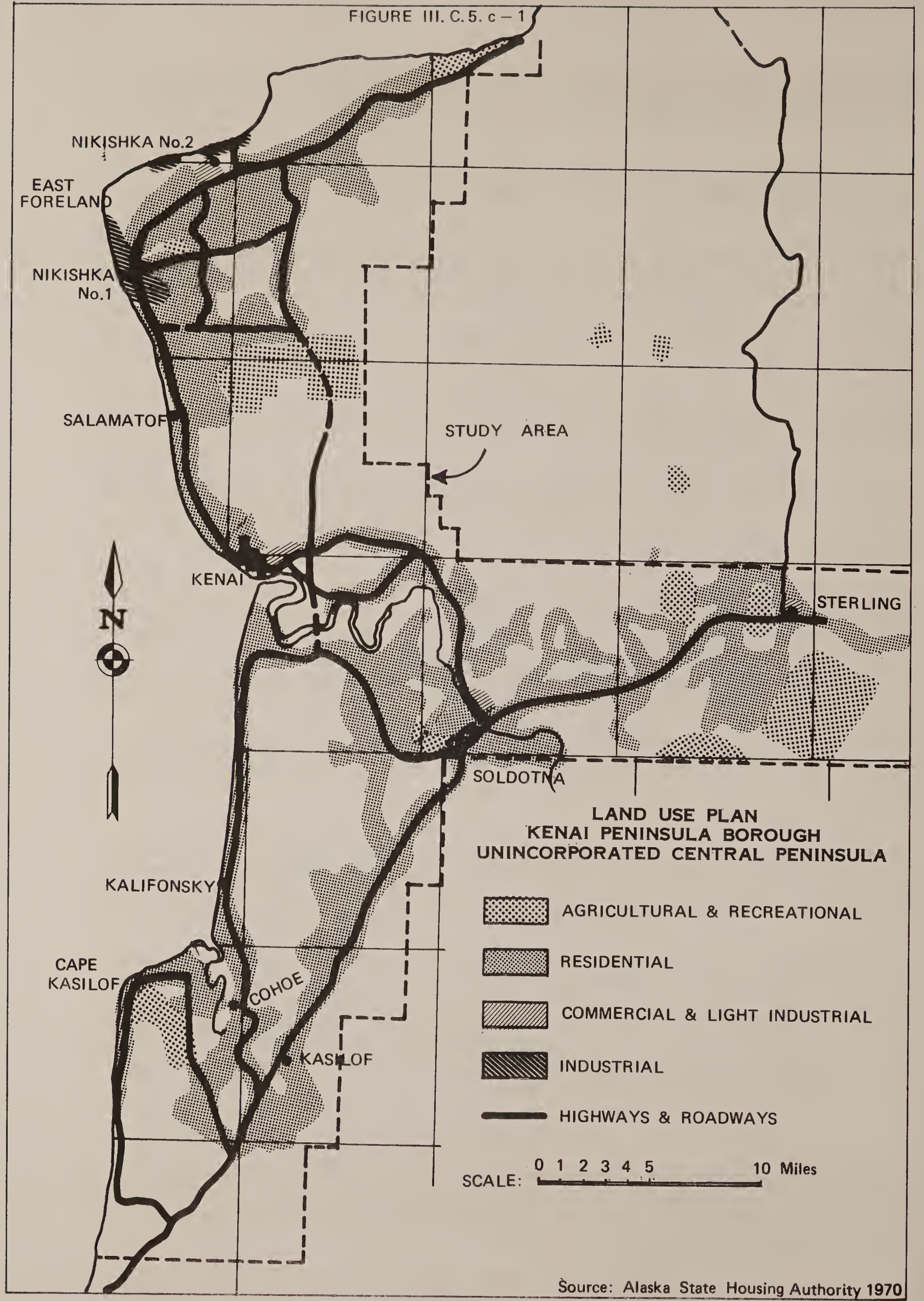
Kenai National Moose Range: The Moose Range has an established Range Master Plan (FWS, 1970) which is currently being updated. The principal land use of the Moose Range is to protect the moose and other wildlife habitat. Other land uses which are not detrimental to this primary land use objective of the range are allowed; recreation, boating, hiking, sport fishing, and motorized access are permitted in designated areas of the range. Oil and gas operations are also permitted on the refuge under regulated conditions. The Swanson River oilfield and the Beaver Creek unit gasfield are presently producing hydrocarbons and are located within the boundaries of the Moose Range. New trapping cabins and other permanent residential structures are not permitted land uses on the Moose Range.

The FWS is sponsoring a study of petroleum development operations on Federal natural resources lands (FWS, 1979) with particular attention to oil and gas operations on the Moose Range. The results of this study are expected to be incorporated into the new Refuge Master Plan when it is completed and adopted.

City of Kenai: The city of Kenai has recently adopted a comprehensive plan which has been approved by the Kenai Peninsula Borough Assembly (R.W. Thorpe and Associates, 1980). The comprehensive plan does not specifically consider energy development facilities or the possibility of a gas transmission line traversing the city limits. The plan, however, is predicated upon an economic and demographic projection which incorporates "moderate" discoveries of hydrocarbons from OCS leasing in Cook Inlet.

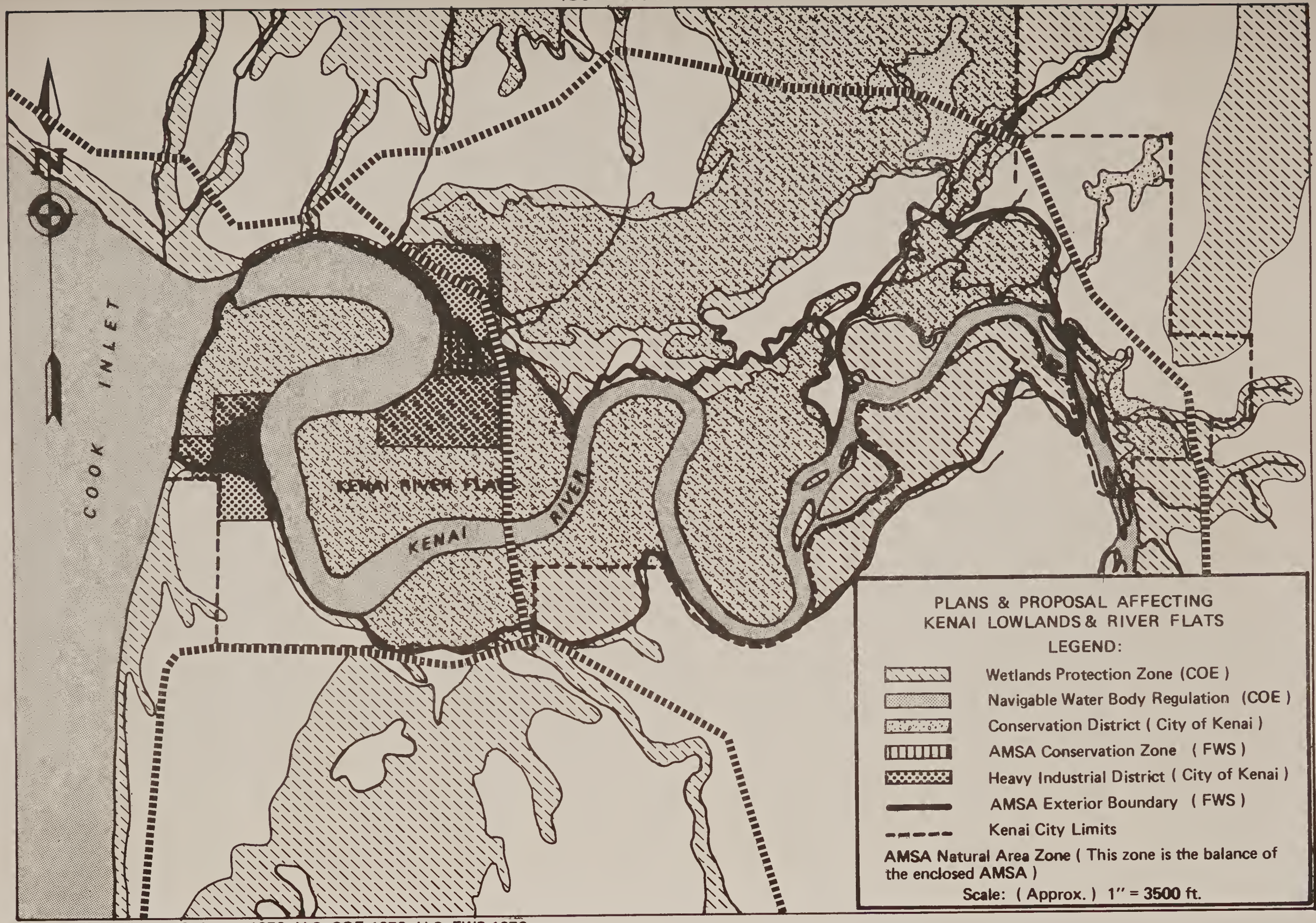
The plan provides for three residential land use districts, a public and quasi-public district, a parks, recreation, and conservation district, two commercial districts, and two industrial districts. Figure III.C.5.c.-2 schematically displays the plan. The plan diagram shows major portions of the undeveloped area being in the "Conservation," "Low Density Residential," and "Medium Density Residential," districts.

FIGURE III. C. 5. c – 1



Source: Alaska State Housing Authority 1970

FIGURE III. C. 5. c – 2


COOK INLET
KENAI RIVER FLATS
KENAI RIVER
PLANS & PROPOSAL AFFECTING
KENAI LOWLANDS & RIVER FLATS
LEGEND:
Wetlands Protection Zone (COE)
Navigable Water Body Regulation (COE)
Conservation District (City of Kenai)
AMSA Conservation Zone (FWS)
Heavy Industrial District (City of Kenai)
AMSA Exterior Boundary (FWS)
Kenai City Limits
AMSA Natural Area Zone (This zone is the balance of the enclosed AMSA)
Scale: (Approx.) 1" = 3500 ft.

Sources: R.W. Thorpe & Assoc. 1979; U.S. COE 1978; U.S. FWS 1979

Planned industrial land use for the city of Kenai is located principally off the Beaver Loop Road on the Kenai River. This area consists of sport and fishing industry activities as well as some oil industry buildings. Future light industrial land use will be accommodated by an Office/Manufacturing Park District, which is situated east of the city airport, and at the city's boundaries of the North Kenai Road.

The Kenai Comprehensive Plan gives special attention to a Conservation District. A conservancy zone has been applied to much of the publicly owned lands (7,950 acres). A conservancy overlay with building performance standards has been applied to private lands (2,050 acres). The purposes of the conservancy designation, according to the city's plan, are: 1) to recognize building constraints caused by wetland areas and soil limitations, 2) to recognize the importance of wetland areas in terms of aquifer recharge to the water supply of the city of Kenai and local industries, 3) to recognize the importance of the Kenai River and its ecology as an economic asset to the viability of the fishing industry, and 4) to encourage development in areas where there are few building constraints in order to accommodate the projected growth of the community as expressed in its economic projections.

The plan sets forth a schedule of permitted, conditionally permitted, and not permitted uses in the conservation district. "Mining," "Transportation," and "Utilities," land uses which are coastal dependent would be conditionally permitted in the Conservation District. However, the plan would not permit industrial uses which are not oriented to the water, which are not coastal dependent, and which pose adverse effects to wetlands in the Conservation District. In its evaluation of wetlands land use compatibility, the plan does not specifically consider energy or oil and gas facilities.

Corps Of Engineers-Kenai River Review: The U.S. Army Corps of Engineers (COE) Alaska District, has developed a program for management of navigable waters and wetlands along the Kenai River (U.S. Department of the Army, 1978). The management program derives from COE authority to regulate navigable waters under the Rivers and Harbors Act of 1899 and wetlands under the Federal Water Pollution Control Act as amended.

The program involves the navigable boundaries of the Kenai River system, adjacent wetland areas subject of COE authority, and contiguous flood plains which, however, are not subject of COE authority. These areas are shown for the coastal portion of the Kenai River and lowlands in figure III.C.5.c.-2.

The COE program includes a land and water use permitting system for the navigable waterways and wetlands. Allowable land and water uses within the regulated areas must be compatible with policies established for management of navigable waterways and wetlands. The policies derive from COE authorities (33 CFR 320-329), other Federal regulations, and the findings of the Kenai River Review.

In the Kenai River or its tributaries, proposals for groins, revetments, dams, gravel removal, canals, navigation channels, and the discharge of dredged or filled material would ordinarily be denied under COE authority. Proposals for the same type of activities in wetland areas adjacent to the river may be denied by the COE, if important wetland values and resources would be damaged greater than the value of the benefits realized of the proposal (33 CFR 320. 4(b)(4)).

Cities of Anchor Point and Ninilchik: The Kenai Peninsula Borough prepared a comprehensive plan for the second class cities of Anchor Point and Ninilchik (Alaska State Housing Authority, 1970). The borough land use plans for these communities include limited rural residential, tourist-related commercial, small scale agricultural, timber harvesting, fishery industries, and public-community land use districts. For the community of Anchor Point, the plan does not contemplate any industrial development. Future growth in Anchor Point is related to the economic development of Homer according to the plan. Light industrial land use demand at Anchor Point could be accommodated in the "Highway" and "Tourist Oriented Commercial" districts in the town core.

For the community of Ninilchik, the plan anticipates industrial land use needs associated with the commercial fishing industry. However, the plan questions the suitability of development on the spit or at the mouth of the Ninilchik River because of natural hazards, tsunami run-up, erosion, and flood plain problems. No other types of industrial land uses are contemplated in the land use plan for Ninilchik.

City of Homer: The city of Homer has adopted a comprehensive plan which is a revision of an earlier plan (City of Homer, 1978). The city's adopted planning policies regarding OCS development include the following:

1. A port development policy is not articulated presently. This should ensue from studies on potential harbor demand which identify the type and level of port activity desired by the city (see below).

2. The city should closely monitor the exploratory phase of OCS activity and be prepared to deal effectively with rapidly escalating land values and land rents, increased traffic congestion, a demand for temporary housing, and congestion in campgrounds.

The city's official land use plan map includes six categories. None of the categories mentions OCS exploration and development activities as being compatible land uses. During the OCS exploratory phase, certain onshore facilities, could, however, be inferred to be compatible with the city's plan. These could include offices, warehouses, open storage areas, helicopter landing sites, and water front docks for movement of goods. These OCS-related land uses during the exploration phase would be accommodated by the city's "Commercial,", "Light Industrial," and "Water Dependent Industrial," land use Districts.

The city's plan includes a section entitled "OCS Development Energy Effects on Homer." This section acknowledges the uncertainties and difficulties of planning for OCS development in advance:

> "The absolute magnitude of the effects [of major intensive industrial development] is impossible to determine until information is available on the amount of oil and gas found and on the location and type of facilities planned by industry. Obtaining timely and accurate information from the industries involved may be a difficult or an impossible task, due to the competition between these corporate entities for land, facilities, services, and other unknown corporate factors. It is essential for the city to work with the companies to develop a means of obtaining timely data on their plans in order to

develop city plans for increasing the benefits of any activities generated by OCS development in lower Cook Inlet (City of Homer, 1978)."

The city has separately sponsored a Port of Homer Development Plan (TAMS Engineers, 1980). This plan has been prepared subsequent to the adoption of the city's comprehensive development plan. The policies in it can be considered to be a more current statement of the city's views regarding siting of onshore OCS-related facilities; the proposed part development plan has not, however, been officially adopted by the city of Homer. This plan would include improvements beyond the Army Corps of Engineers' proposed expansion to the city's small boat harbor (U.S. Department of the Army, 1979). Refer to figure III.C.5.c.-3 for a depiction of the draft plan diagram. The plan consists of four phases.

A first phase would improve the existing commercial fishing dock by adding a new 230-foot dock and redeveloping the existing 160-foot dock. This phase would more than double the berthing capacity of the existing commercial fishing dock.

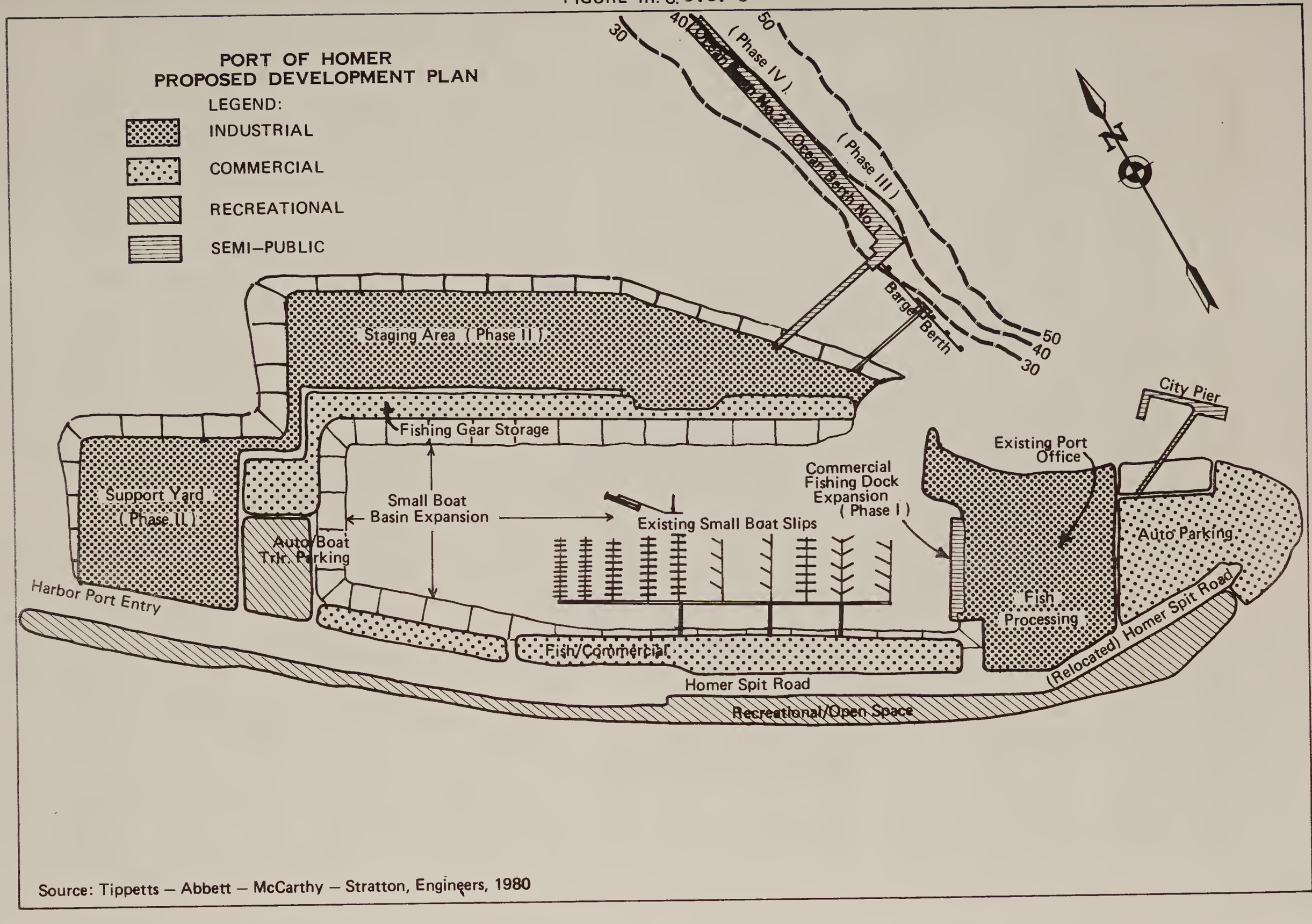
The second phase would expand the existing small boat harbor and create a surface berm area northeast of the boat harbor basin. The boat harbor would be expanded from 100 berths to 1,525 berths. The port development plan differs from the COE boat harbor plan in that the berm width northeast of the basin would be enlarged from 225 to 585 feet. The port plan would use a level portion of the berm as a 30.5 acre staging area, cargo storage area, cargo marshalling area, and an auto parking area. The open end of the berm would access the phase III and IV improvements of the proposed port plans.

Phase III improvements would include a new ocean dock constructed at a 40-foot water depth (MMLW). A 600-foot trestle connecting the berm staging area with the ocean berth dock would be aligned in an easterly direction. The ocean berth dock would be 700 feet long and aligned northward, which is parallel to the 40-foot MMLW isobath and also aligned with the tidal flux. The ocean berth would include handling equipment for containerized as well as general cargo. The berth will accommodate major oceangoing vessels, large fishing vessels, the largest class OCS support boats, and rig tenders.

An optional Phase IV is planned if commercial marine traffic warrants the port development to this phase. This phase would add an additional 700-foot ocean berth to one end of the Phase III ocean berth dock. Also, a barge roll-on/roll-off and berth trestle would be constructed to accommodate the largest class of barges and oceangoing ferries of the Alaska Marine Highway system, i.e., 400-foot plus vessel lengths.

The development plan contemplates the first three phases of the improvements being constructed and completed in 4 years. The plan is predicated upon accommodating various types of marine transportation activity and goods movement needs of the city. The plan is specifically designed for OCS support base needs: The ocean berth dock would berth large support boats without interferences to commercial fishing operations which would be handled at a separate commercial fishing dock. The plan also sets aside an approximately 30-acre staging area for temporary storage and forwarding of all types of goods. Additionally, the plan establishes a 12-acre support yard and a relocation site for the existing petroleum product storage tanks.

FIGURE III. C. 5. c. -3



Source: Tippetts – Abbett – McCarthy – Stratton, Engineers, 1980

City of Seldovia: The city of Seldovia recently revised its comprehensive master plan (Pacific Rim Planners, 1980). This plan was submitted to and adopted by the Kenai Peninsula Borough Assembly. Land use policies of the plan are to strengthen the waterfront commercial area, distinguish the waterfront-related commercial land use needs from other development needs, and siting residential and other land use development in suitable areas given the scarcity of lands not subject to building constraints.

The economic development policies of the plan are reflected in the types of industrial and commercial land uses allowed. The Seldovia Plan stresses bottomfishing capability and fish processing facilities, availability of additional sites for industrial land use, strengthening commercial activities, and providing a marine service function for offshore development. The plan indicates that OCS support and supply functions should not interfere with the existing economic base and community values. The city's land use plan diagram does not specifically identify industrial land use districts which are suitable for OCS support/supply functions.

Katmai National Monument: Both the existing and enlarged portions of the Katmai National Monument are the subject of an approved master plan (DOI, NPS, 1973). The plan sets forth a land use classification and a general development scheme which are based on NPS policy, landscape features, and proposed resource conservation of the area. Figure III.C.5.c.-4 reproduces the land classification diagram for the monument master plan. The primary objective for the plan is to "preserve the ecosystem in its natural state, and to provide the public with a rewarding park and wilderness experience" (DOI, NPS, 1973). Refer to section III.C.5.c. regarding NPS regulation of land uses in the enlarged portion of the monument. The plan generally allows recreation activity which preserves the wilderness and primitive character of the monument. Aircraft landing, motor boating, and sportfishing are regulated, allowed seasonally, and restricted to specific locations (30 CFR 7.46).

City of Port Lions: The city of Port Lions has adopted a comprehensive plan in 1975 (Galliett and Silides, 1975) for the incorporated area of the city. The plan evolved from earlier assistance in relocating the community of Afognak which was substantially damaged in the 1964 earthquake. The plan provides for residential, commercial, and industrial development. A schematic version of the Port Lions comprehensive plan is shown in figure III.C.5.c.-5. There are three subdivisions of land with vacant residential parcels available in Port Lions; the Port Lions townsite, the Wakefield subdivision, and the Port Lions subdivision-first addition. At the time of plan preparation, there were approximately 95 vacant and 50 improved residential parcels. Additional residential land has been identified and reserved in the General Plan (Wakefield Subdivision and Port Lions Subdivision-first addition.

Commercial land uses in Port Lions consist of relatively small parcels (approximately 1 acre) in the townsite and fronting on Settler Cove. The Peregrebni Peninsula includes a large area (approximately 60 acres) on the Kizhuyak Bay side which is designated for industrial land use. Other potential industrial land uses could be located along Airport Road and facing Settler Cove (personal communication, 1980).

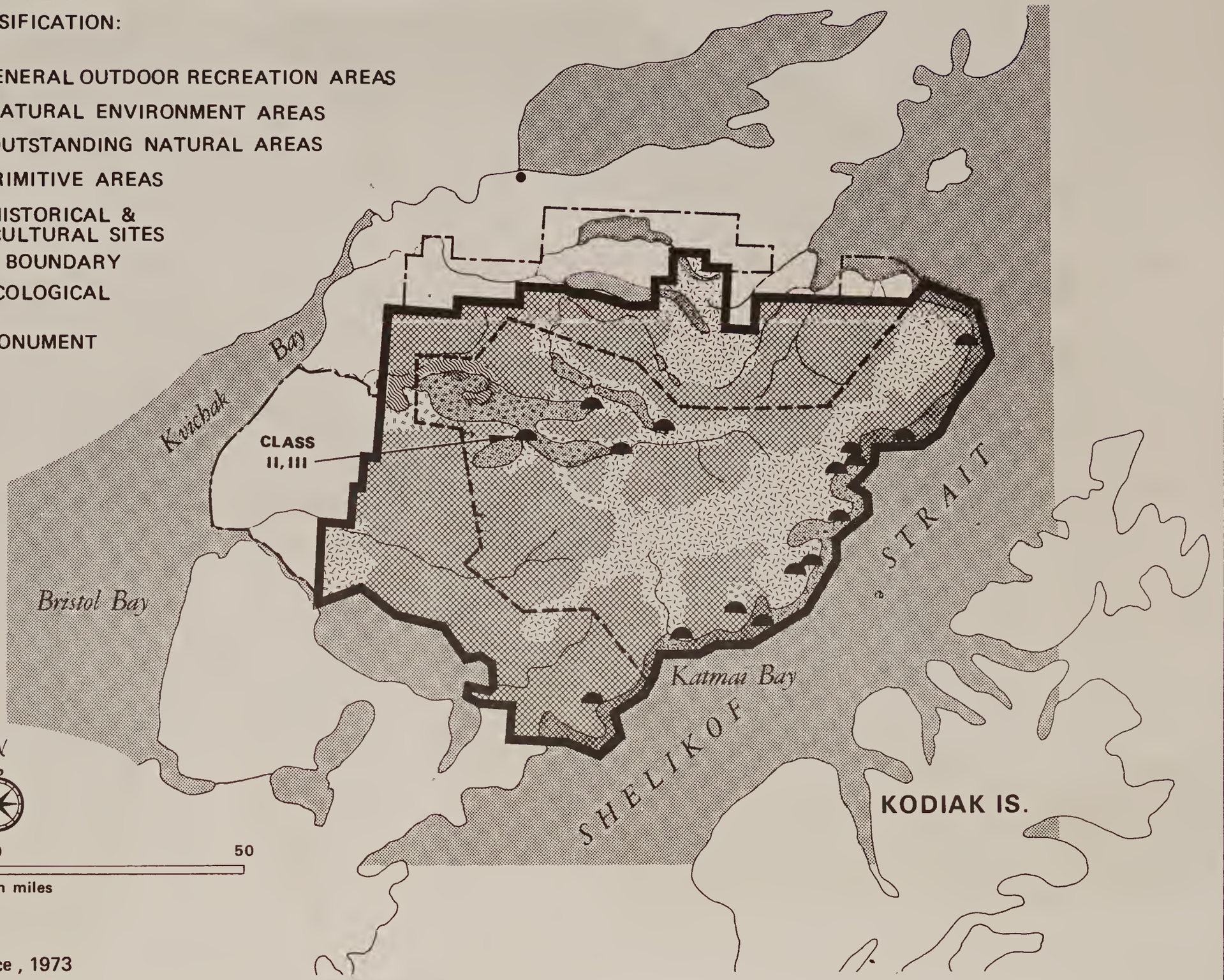
The city plan does not include any official statement of goals or development objectives. Moreover, the plan does not indicate what types of land uses would be allowed in the respective land use districts. It has been informally

FIGURE III. C. 5.c – 4

KATMAÌ NATIONAL MONUMENT MASTER PLAN

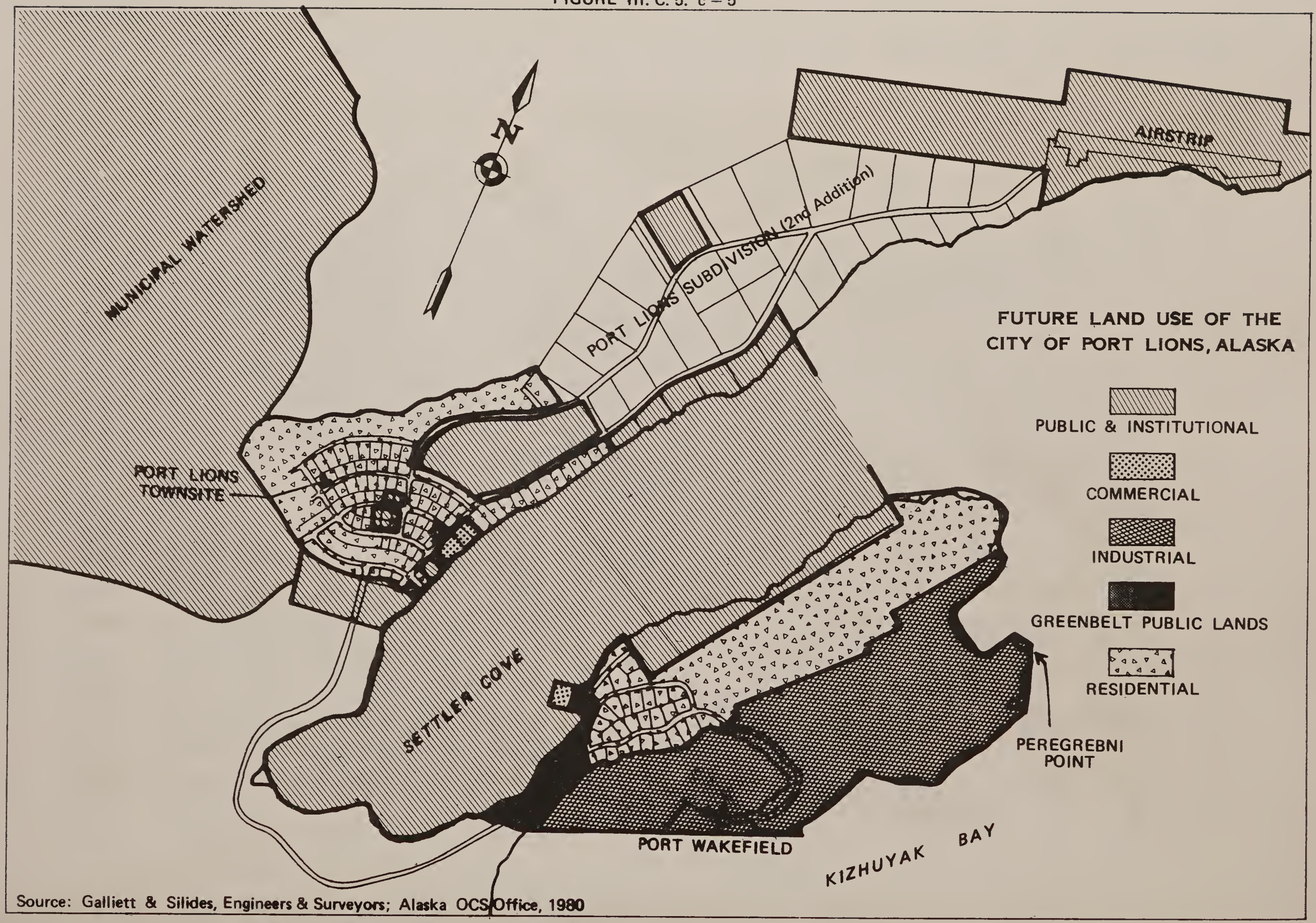
LAND CLASSIFICATION:

- CLASS II – GENERAL OUTDOOR RECREATION AREAS
- CLASS III – NATURAL ENVIRONMENT AREAS
- CLASS IV – OUTSTANDING NATURAL AREAS
- CLASS V – PRIMITIVE AREAS
- CLASS VI – HISTORICAL & CULTURAL SITES
- PLAN AREA BOUNDARY
- AREA OF ECOLOGICAL CONCERN
- EXISTING MONUMENT BOUNDARY



Source: U.S. National Park Service , 1973

FIGURE III. C. 5. c – 5



Source: Galliett & Silides, Engineers & Surveyors; Alaska OCS Office, 1980

determined that the Kizhuyak Bay side of the Peregrebni Peninsula is suitable for OCS port activity and a support and supply base (personal communication, 1980). However, the plan neither officially provides for nor precludes this type of industrial land use.

The city's plan has been amended a few times, and a zoning ordinance has been adopted to fix the types of land uses allowed. The Kodiak Island Borough has been requested by the city to update and revise its plan. The borough has submitted an application to the Alaska Department of Community and Regional Affairs for funding assistance for this purpose (personal communication, 1980).

6. Transportation Systems: This section describes the transportation systems that could be affected by the proposed lease sale. The section will be divided into three parts. The first division will deal with the land, air, and water transport systems of potentially affected towns and cities located on the Kodiak Archipelago. The second division will treat the transport characteristics of the city of Anchorage. The third part will portray the existing state of the transportation systems in the Cook Inlet area.

a. Kodiak Archipelago: Port Lions, a major area considered for onshore development, lies some 26 air kilometers (17 mi) northwest of the city of Kodiak. The town has no overland communications with any other part of Kodiak and relies entirely on air and water transport for resupply and passenger movement.

Land Mode: The road system of Port Lions consists of 6.75 kilometers (4.19 mi) of improved dirt road and connects the town with both Port Wakefield and the airport.

Vehicle densities in Port Lions are extremely low. The State of Alaska has estimated that the average annual daily traffic for this roadway is approximately 20 vehicles. This figure is subject to extreme seasonal variations and is expected to be low as there appears to be a much higher degree of automobile ownership than is usually found among the citizens of isolated Alaskan towns.

Air Mode: Port Lions is serviced by a State-maintained 808 meters (2,650 ft) gravel runway which could be extended another 762 meters (2500 ft). However, some 305 to 457 meters (1,000-1,500 ft) of the extension would have to built into Kizhuyak Bay. The township receives scheduled flights by Kodiak-Western Airlines. Although Kodiak-Western attempts to maintain scheduled service, bad weather and low passenger numbers frequently cause flight cancellations. During 1976/1977, Kodiak-Western dispatched some 443 planes, 711 passengers, and one metric ton (1.12 tons) of freight to Port Lions.

Ground facilities at the Port Lions Airfield, including navigational aids, are entirely lacking. The airport, however, is surrounded by terrain which is flat enough to construct some hangers and a small supply yard.

Water Mode: The town of Port Lions is served by two docks. The largest pier (the former Wakefield Cannery dock) is an L-shaped structure which extends some 305 meters (1,000 ft) into Port Wakefield before assuming a right angle. The outer face of the cannery dock is some 122 meters (400 ft) in length while

the length of the inner face is some 91 meters (300 ft). The maximum water depth along the cannery dock is some 22 meters (72 ft) at MLLW and occurs off the southern face. The cannery dock has about 1,487 square meters (16,000 ft^2) of usable working surface. It also contains a 2,500 lb hoist and a 167 square meter (1,800 ft^2) freezer storage room.

The second pier is a floating dock which is joined to the cannery dock. The floating dock provides 22 berths for fishing vessels with a total of 244 meters (800 linear ft) available for docking space.

Transient fishing vessels visiting Port Lions during the year may number as many as 127. Some 52 fishing vessels make the harbor a permanent home (Corps of Engineers, June 1977).

The town of Port Lions is also a scheduled stop on the route of the M/V Tustamina, a ferry of Alaska Marine Highway System. The M/V Tustamina provides passenger and freight connections between Port Lions, Kodiak City, and the Alaska mainland.

The U.S. Army Corps of Engineers has planned to expand the small boat harbor of Port Lions to provide more berths for fishing vessels and to take some of the vessel traffic pressure off of the Kodiak small boat harbor. For a more detailed discussion of this proposed action, the reader is directed to the appropriate portions of section IV.A.1.f.

Talnik Point is situated about 4 kilometers (2.4 mi) north of Port Lions. The point is located on Kizhuyak Bay, a tributary to the larger Marmot Bay region. Water depth immediately off Talnik Point falls to 18.3 meters (60 ft). Two kilometers (1.2 mi) east of Talnik Point, water depth is 91.4 meters (300 ft). The water depth continues to increase toward the mouth of Marmot Bay, eventually reaching 183 meters (600 ft). South of Talnik Point, water depth is 18.3 meters (60 ft) until Peregrebni Point. There depths are 9 to 12 meters (30-40 ft).

Kizhuyak Bay is some 8 kilometers (5 mi) wide near its mouth and narrows to 2.4 kilometers (1.5 mi) near Peregrebni Point. Navigation from the Marmot Bay entrance to Talnik Point is free of major submarine hazards; however, rocky shoals are in abundance along the eastern side of Kizhuyak Bay.

Whale Passage and Kupreanof Strait are two ajoined bodies of water which function as the primary marine route for fishing vessels traveling between Marmot Bay and the Shelikof Strait. Tidal currents in Whale Passage (near Bird Point) run between a flood tide of 4.4 knots and an ebb tide of 5.2 knots. For Kupreanof Strait (off Chernoff Point), the tidal currents vary between a flood tide of 2.2 knots and an ebb tide of 1.5 knots.

The Coast Pilot 9 (U.S. Department of Commerce, 1979) urges caution for all mariners using Whale Passage, even if favorable climatic conditions exist. Transiting Whale Passage during periods of maximum current is to be avoided as floating aids to navigation could be dragged off station. Navigation within the Kupreanof Strait is not as difficult as it is in Whale Passage. The Strait is between 2.9 and 4.9 kilometers (1.8-3 mi) wide. The mid-channel of Kupreanof Strait is more than 18 meters (60 ft) deep and is free of hazards. However, there are several shoal areas along the shores and movement within the strait should be avoided during storms.

The U.S. Army Corps of Engineers set up an anemometer at Port Lions in 1971, which collected wind data until 1975. Some of this data has been interpreted. Peak wind gust observed during the monitoring period was 91 kilometers per hour (57 mph) at 090° in February of 1975. Maximum sustained wind velocity was observed during January of 1974. The wind registered 64 kilometers per hour (40 mph) at 100° for 16 days (Eckert, 1980). The bulk of the data, however, has been stored by the Corps and is awaiting the funding necessary for interpretation.

In regard to wind and wave actions around Talnik Point, local individuals queried indicated that the point was far more exposed to northern weather than Port Lions and that wind and wave action was such that a major facility built near Talnik Point would require a breakwater.

Ouzinkie: The fishing village of Ouzinkie is located on Spruce Island along Narrow Strait. Ouzinkie has only a rudimentary transportation infrastructure. The road system of the village consists of about 5 kilometers (3 mi) of borough-maintained, improved dirt road. The village has no airstrip. Passengers and freight enter and leave the village via Kodiak-Western seaplanes.

Ouzinkie's small dock is about 34 meters (104 ft) long and has 90 meters (280 ft) in depth along the face. Nearshore bathymetry indicates that the facilities at Ouzinkie could be expanded to accommodate deep draft vessels. But the confined nature of Narrow Strait would hinder the movement of large tankers.

Kodiak City: For further information about the transport systems of the subject area the reader is directed to graphic 9 of the DEIS released for the OCS lease sale 46 which was to occur in December 1980. For another discussion of the issue, attention is directed to the initial sale 46 DEIS published in 1977.

b. Anchorage: The city of Anchorage is the primary transportation center in Alaska. It is an important stop for the Alaska Railroad; it has access to a major north-south, year-round highway; it is serviced by an international airport; it has the State's most extensive dock facilities; and it has the largest market area in the State. Any development activity that occurs within Alaska will probably affect the social, economic, and transportation systems of the city of Anchorage.

Land Mode: The road system of the city of Anchorage contains about 1256 kilometers (780 mi) of municipal and State maintained roads and is sufficiently viable to allow an average volume of traffic to flow without difficulty. However, once beyond the metropolitan area, truck and automobile traffic travelling south may be subject to man-made and natural events which can result in considerable time delays.

Due to the rising volume of traffic passing between the Kenai Peninsula and the city of Anchorage, the State of Alaska has been attempting to improve the carrying capacity of the Seward Highway, particularly that section of roadway between Girdwood and the edge of metropolitan Anchorage. In 1978, the State began an extensive construction effort to improve the Seward Highway between miles 111 and 115. This construction project will be completed in July 1980. Average Annual Daily Traffic (AADT) figures for the Seward Highway at mile 115 (just as it enters metropolitan Anchorage) have risen from 1,929 in 1970 to

3,340 in 1979. AADT figures for this traffic point are seasonally variable and range from a July (1979) high of 5,896 vehicles to a January (1979) low of 1,989 vehicles. Truck and bus traffic constitute only 6 percent.

Apart from the delays which would arise during periods of peak summer recreational use, east and west bound truck and bus traffic using the Anchorage-Girdwood link encounter few obstacles to the maintenance of timely schedule. However, this section of road is prone to avalanches which may close the road during spring for over a week at a time.

Air Mode: The Anchorage International airport handled 236,000 operations (landings and take-offs) in 1976 which is 77 percent of the capacity estimated in the 1971 Master Plan. The primary purpose of the new north-south runway, presently under construction, is to provide a runway capable of accommodating larger jets in cross-wind conditions and to alleviate aircraft noise east of the airport by placing the majority of aircraft operations over water. The completed runway will also raise the airport operational capacity to 334,000 operations, a 9 percent increase. The runway will be used for air carrier arrivals and one of the east-west runways will be used for air carrier departures. The three existing asphalt runways include two that are greater than 3,048 meters (10,000 ft) in length.

The facility serves an important role in moving freight and passengers to, from, and within Alaska. In 1976, throughput tonnage of the airport amounted to 107.8 thousand metric tons (118.8 thousand tons). This was 11.1 percent of the Port of Anchorage's throughput for general cargo in that year. Transshipment by Wien, and to a lesser extent, Northern Air Cargo, Alaska International Air, and Great Northern of goods arriving in Anchorage by the water mode to remote Alaskan communities accounts for outbound tonnage being 50 percent greater than inbound tonnage at the airport.

Water Mode: The Port of Anchorage consists of four terminals owned and operated by the Municipality. These terminals serve deep-draft ships and six private docks which serve specialized barge shipments.

Handling equipment available for the general cargo terminals includes two 24.9 metric ton (27.5 ton) container-handling cranes and four level-luffing gantries with 36.3 metric ton (40 ton) capacities. Two portable transfer ramps for roll-on/roll-off operations are also available.

Scheduled for construction in 1980 by York Steel Company on land leased from the Alaska Railroad is a port facility that will provide a transfer dock for rail barges, rail spurs, warehouses for carge storage, and a repair facility for large boats. As part of the project, a rail-barge facility might also be built north of Nikiski on the Kenai Peninsula.

The dock face of the public terminals is maintained to a depth of 10.7 meters (35 ft) mean lower low water (MLLW) by the Corps of Engineers. Statutory responsibilities of the Corps of Engineers usually are limited to channel dredging near ports, but the Port of Anchorage benefits from special Congressional legislation which enables dredging by the Corps alongside the dock. During 1978, three separate dredging operations were necessary to maintain adequate depth for deep-draft vessels. The private docks are limited to ships having a draft of 6.1 meters (21 ft) or less.

The extreme tidal range of 12.7 meters (40.7 ft) creates high mid-stream velocities and eddy currents along shore, but these conditions have little effect on deep-draft vessels. Shoaling occurs west of Point Woronzof near Fire Island and limits the channel width for deep-draft vessels to 610 meters (2,000 ft). Four groundings occurred in this general area during the late 1960's. None produced serious consequences.

A review of table III.C.6.b.-1 indicates that both in terms of vessel arrivals and cargo throughput, activity at the port of Anchorage has declined during the last 4 years. In 1976, arrivals from the port of Anchorage numbered 792 vessels. By 1979, vessel arrivals had declined to 410, largely due to the cooling of the Alaskan economy and by the construction of a 36,000 barrels/day pipeline from the Nikiski Tesoro refinery to the city of Anchorage.

Navigation in upper Cook Inlet during the winter is complicated by the absence of buoys, which are removed by the Coast Guard when ice conditions commence.

Except for liquid bulk commodities and bulk cement, no single commodity stands out. Shipments that can be contained make up 42 percent of the inbound tonnage and 73 percent of the outbound tonnage. The Port of Anchorage is the State's major port of entry for containerized freight. The large ships that carry containers and trailer vans are able to operate to the port throughout the year unlike tugs and barges.

The Port of Anchorage's ability to attract frequent year-round service by two carrier handling containers and vans that can be efficiently loaded and unloaded has made it Alaska's premier port of entry. In 1976, it handled over three times as much tonnage as Whittier, over five times as much as Valdez, and over 13 times as much as Seward, despite weather and shoaling constraints. The port has adequate staging areas at present, but geographical constraints prevent a major site expansion. The additional 6.9 hectares (17 acres) which is available will require expensive site improvements because of drainage problems.

c. Cook Inlet:

Land Mode: Primary vehicle routes serve the major centers of the Kenai Peninsula and connect them with southcentral Alaska. Unlike the western shore of the inlet, which has no roads, potential oil and gas facility sites on the Cook Inlet portion of the Kenai Peninsula are all located near primary vehicle routes.

Much of the existing highway of the Kenai is currently being used to near capacity and should be upgraded. Table III.C.6.c.-1 shows that some 60 percent of the principal routes operate at between 65 and 73 percent of capacity. Additionally, those links operating at high capacity levels are in need of improvement along 70 percent of their length.

In the 5-year period ending in 1978, annual average daily traffic (AADT) figures for the Kenai Peninsula road system have shown a sharp increase, with the largest increase occurring from Soldotna to the Sterling Highway junction. Truck and bus traffic are an important component of the Kenai Peninsula traffic. Truck and bus traffic entering the Kenai-Nikiski area equal approximately 10 percent of all vehicular traffic.

Table III.C.6.b.-1
Port of Anchorage-Historical Summary

Year	Metric Tons	(Tons)	Year	Metric Tons	(Tons)
1969	1,639,642	(1,807,405)	1975	2,663,625	(2,936,159)
1970	1,757,186	(1,936,976)	1976	2,660,276	(2,932,468)
1971	1,616,653	(1,782,064)	1977	2,040,300	(2,267,000)
1972	1,867,157	(2,058,199)	1978	1,866,145	(2,073,498)
1973	2,381,132	(2,624,763)	1979	1,504,007	(1,671,719)
1974	2,122,965	(2,340,181)			

Source: U.S. Department of the Army, Corps of Engineers, 1980.

Table III.C.6.c.-1
Traffic and Road Conditions For
Kenai Peninsula Primary Routes[1/]
1977

	Distance Km (Mi)	Capacity Vehicles/ Hour[2/]	30th Highest Hour	Peak Hour Factor[3/]	Volume/ Capacity[4/]	Deficient Miles[5/]	Five Year Summary Of AADT[6/]	
Homer-Ninilchik	56.6 (35.2)	730	268	0.21	0.37	0%	1974	1,130
							1975	1,215
							1976	1,325
							1977	1,453
							1978	1,400
Ninilchik-Soldotna	60.0 (37.3)	766	268	0.21	0.35	0%	1974	1,095
							1975	1,179
							1976	1,285
							1977	1,278
							1978	1,698
Soldotna-Sterling Highway Junction	94.3 (58.6)	484	316	0.13	0.65	70%	1974	1,484
							1975	1,723
							1976	2,155
							1977	2,519
							1978	2,537
Sterling Highway Juntion-Girdwood	84.7 (52.6)	495	149	0.25	0.73	72%	1974	1,422
							1975	1,594
							1976	1,552
							1977	1,453
							1978	1,719

1/ Traffic figures from fixed traffic recorder stations within or near route segments.
2/ Capacity derived from "1972 Sufficiency Rating Report," Alaska Department of Highways.
3/ Peak hour factor = (30th highest hour)/AADT.
4/ Volume/capacity = (30th highest hour)/capacity.
5/ Deficiency is the rating valve established by the State as the point at which improvements should be considered.
6/ AADT = Average annual daily traffic.

Source: Peter Eakland and Associates, 1978.

As would be expected, seasonal traffic variations are pronounced. Summer AADT are 150 to 200 percent of the yearly mean AADT. Winter AADT volumes are 9 to 65 percent of the yearly mean AADT estimates.

Kenai Peninsula traffic should, over the short-term, continue to increase. The proposed expansion of Homer's fishing industries, the construction of the Pacific LNG Plant, the traffic resulting from the Bradley Lake Hydroelectric project, as well as the peninsula's continued attraction to recreationalists, will ensure the accelerated use of the Kenai roadways despite any pending energy problems.

Homer Air Mode: The Homer airport runway, which measures 2256 meters (7,400 ft) long by 45.7 meters (150 ft) wide, parallels the shoreline and allows overwater approaches from both directions. (The airport is owned and operated by the State of Alaska; the Federal Aviation Administration owns adjacent land that would have to be acquired for expansion to take place.) An adjacent float plane facility at Beluga Lake has a 914-meter (3,000 ft) runway (tables III.C.6.c.-2 and -3).

Two scheduled carriers serve Homer. The community is an intermediate stop for Wien's 737 jet flights between Kodiak and Anchorage. During the year ending June 30, 1977, Wien completed only 76.9 percent of its scheduled flights to Homer. It is also the southernmost destination of Alaska Aeronautical Industry's (AAI) commuter route from Anchorage that serves Soldotna and Kenai. The airport is also served by both fixed-wing and rotary-wing air taxi operators. Several additional rotary-wing operators provide services on contract to offshore oil operators.

The Alaska Department of Transportation has forecast a steady 7-percent annual growth in operations at the facility for the next 20 years. A draft airport development plan has been prepared to address existing and future problems.

Presently, the terminal facilities and adjacent parking are inadequate but they cannot be expanded at the present location. The terminal is closer to the runway than FAA regulations permit, and height restrictions are also violated. The existing terminal, which is owned by Wien Air Alaska, has seating capacity for only ten persons. These circumstances make it difficult to provide adequate security. Parking is limited to 28 vehicles. The recommended plan is to move the terminal and air carrier operations to the north side of the runway. Facilities on that side would include a perpendicular taxiway to an apron, a heliport for large helicopters, and parking for 50 vehicles.

Kenai: Landing facilities at the Kenai Airport consist of an asphalt runway, which is 2286 meters (7,500 ft) long by 45.7 meters (150 ft) wide, and a parallel float plane basin 762 meters (2,500 ft) long (tables III.C.6.c.-2 and -3). The airport has adequate approach and landing aids to handle foreseeable operations, including a control tower and a glide slope. The practical annual capacity is 210,800 operations.

The Kenai facility currently receives two scheduled carriers with permanent operating authority, AAI and Wien. AAI is a commuter airline and offered 30 flights per day to Kenai in the summer of 1979, three of which were exclusively for freight. Commuter airline flights have increased from 9 in 1971, to 19 in 1976, and finally, to the present 30. The fish processing industries

Table III.C.6.c.-2
Lower Cook Inlet Principal Airports - Runways and Ground Facilities

Community	Location	Owner	Runway Heading (1)	Length Meters (ft)	Width Meters (ft)	Surface Type	Heliport (2)	Terminal Building	Hangers	Fuel	Maintenance
Homer	2½ Mi. east of downtown Homer	State of Alaska	3-21 3-21	(7,400) (3,000)	(150) (600)	Asphalt Water	No	Yes	Yes	Yes	Yes
Kenai	½ mi. north of downtown Kenai	City of Kenai	1-19	(7,498)	(150)	Asphalt	No	Yes	Yes	Yes	Yes
Soldotna	2 mi. south of downtown Soldotna	City of Soldotna	7-25	(5,000)	(150)	Asphalt	No	Yes	Yes	Yes	Yes
---	Drift River	Cook Inlet Pipeline Company	5-23	(4,300)	(150)	Gravel	Yes	Yes	Yes	No	No

Notes: (1) Headings are expressed in true compass readings. For example, runway 3-21 has a heading of 30° or 210° depending upon the direction of a plane when landing or taking off.
(2) Although not all airports listed have designated heliports, each has at least one operator who uses helicopters and who has a private area for operating them from.

Source: FAA, 1977, and Peter Eakland and Associates, 1980.

Table III.C.6.c.-3
Lower Cook Inlet Principal Airports - Operations and Aids

Community	Service Level (1)	Design Type (2)	Total Operations	Based Aircraft (3)	Scheduled Airlines	Based Air Taxis	Control Tower	Taxiways	Navigation/Landing Aids (4)			
									Runway Heading	Lighting	Radio	Other
Homer	AC	AC	37,198 (1977) 36,760 (1978)	65	2	3	No	Yes	--- 3 3/21 21	 MALS VASI REIL	VORTAC DF, FSS, NDB LOC/DME	RCAG
Kenai	CS	GT	89,965 (1977) 87,425 (1978)	110	2(5)	5	Yes	Yes	--- 19 1 1	 MALS REIL VASI	DF, FSS, NDB, VOR/DME GS, LOC MM, OM	
Soldotna	GS	GU	66,000 (1978 est.)	125	3	No	Yes	---			SFO	---
Drift River	Private	Private	Fixed Wing - 750 (1977 est.) Rotary Wing - 1,600 (1977 est.)	3	0	0	No	No	---	Rotating Beacon	---	---

Notes: (1) Service Level
AC = Air Carrier (Certified Service)
AL = Air Carrier (Intrastate Qualifications)
GS = Commuter Service
GA = General Aviation

Table III.C.6.c.-3--Continued

(2) Design Type
AC = Air Carrier (Certificated Service)
AL = Air Carrier (Intrastate Qualifications)
GU = General Utility
BT = Basic Transport
SP = Seaplane Base

(3) FW = Fixed Wing; RW = Rotary Wing.

(4) Lighting: MALSR = Medium intensity approach lights with RAIL: REIL = Runway end identification lights; RVR = Runway visual range; VASI = Visual approach slope indicator.

Radio: ASR = Airport surveillance radar; DF = Direction finder; DME = Distance measuring equipment; GS = Glide slope; LOC = Localizer; NDB = Non-directional radio beacon; PAR = Precision approach radar; SFO = Single frequency outlet; VORTAC = Combined VOR and TACAN (TACR).

Other: ATCT = Air traffic control tower; FSS = Flight service station; MM = Middle marker; OM = Outer marker; RCAG = Remote control air ground facility; RCO = Remote communications outlet (FSS).

(5) A third carrier, Polar Airlines, was granted an emergency exemption to provide Anchorage-Kenai service for 120 days from May 29 - September 26, 1979.

Source(s): FAA, 1977; DOTPF, 1978; Peter Eakland and Associates 1980.

of Kenai combined with large salmon catches in Western Alaska produced, in 1979, the frequent landings of large cargo aircraft. Whether this situation continues in the future is open to debate; however, local officials have requested the FAA to design five tie-down spaces for C-130 aircraft.

Kenai will continue to be an active market for commuter airline services. The construction of the Pacific LNG plant, as well as the city's existing oil and gas industry, should produce a volume of passengers sufficient to sustain a high frequency of scheduled commuter airline service.

Soldotna: Soldotna Airport, a general utility airport, is located on the southeast corner of the town (tables III.C.6.c.-2 and -3). It has a 1,524-meter (5,000-ft) by 46-meter (150-ft) asphalt paved runway with an estimated pavement strength of 32000 kilograms (70,000 lbs) gross weight. AAI now makes three daily round trips between Soldotna and Anchorage with an intermediate stop in Kenai except for Saturday and Sunday.

The computed annual capacity of the airport is 150,000 operations, and the computed hourly capacity is 110 operations. The city of Soldotna records 125 aircraft being based at the airport in 1978, a 71 percent increase from the 73 planes recorded in 1973. During the winter, one runway is left unplowed which allows for the use of planes fitted with skis. During 1978, an estimated 103546 kilograms (228,277 lbs) of cargo was handled at the airport and an additional 36511 kilograms (80,491 lbs) of mail.

The 10-year National Aviation System Plan (FAA, 1977) includes recommendations to expand and pave an existing apron and runway, construct and pave a new apron, add new approach aids such as VASI and REIL, and improve existing buildings.

Homer Water Mode: Existing port facilities are located toward the end of the Homer Spit on the Kachemak Bay (north) side. The Homer City pier, which extends 140.2 meters (460 ft) from shore, serves deep-draft vessels. It has three docking faces. The largest face is 125 meters (410 ft) long and has water depth alongside of 7.6 meters (25 ft). Its northwest section is 8.8 meters (32 ft) wide and the southwest section 18.3 meters (60 ft) wide. The M.V. Tustemena, of the Alaska Marine Highway System, has preferential berthing privileges at this facility. It is also used for shipment of fish products, occasional freight barges, and the receipt of petroleum products from the Standard Oil tanker, Alaska Standard. Supply boats serving offshore drilling activities have used the facility to load fuel and water. Water is available at the pier, but diesel fuel and gasoline supplies must be delivered by truck. A truck-mounted crane is available from a local contractor for onloading and offloading heavy cargo.

The northwest face, which is 42.7 meters (140 ft) long and 8.8 meters (32 ft) wide, is used for mooring the Coast Guard buoy tender, CGC Sedge. It has a 4.0-meter (13-ft) draft. The southeast face, 18.3 meters (60 ft) long, has a draft of 3.7 meters (12 ft) and is used principally by fishing boats.

The access channel receives annual maintenance dredging but no dredging has taken place within the basin since 1964.

The 42.7-meter (410-ft) face of the city pier, with its 7.6 meters (25 ft) of water, can handle ocean-going barges and small tankers, but dredging would be required for ships of the size operated by TOTE and Sea-Land into Anchorage to use the facility. Supply boats would be unable to use facilities in the small boat harbor basin because of water depth and inadequate room for turning maneuvers. The industrial park will primarily serve fishing vessels, as indicated by the design depth of the access channel.

The entrance to Kachemak Bay is rich in seafood resources, and a conflict between marine shipping and fishing interests exists. This area must be crossed by ships picking up and discharging pilots. Increased vessel traffic in Cook Inlet brought a corresponding increase in damage to fishing gear. The Coast Guard cooperated with the pilots and the fishermen in establishing a voluntary vessel separation scheme, which has been in operation since 1976 (fig. III.C.6.c.-1.). Lanes from both the north and the south are provided. A move to make the vessel separation scheme permanent has been urged by some fishermen. Crabbers have suggested the use of only a single lane in order to expand their crabbing area. The Coast Guard feels that the voluntary system has worked well and that it is preferable to a permanent system due to its flexibility.

Ice does not present a major problem to vessel operations in the Homer area, but ice floes can interfere with operations at the Homer City pier from January to March. If the floes are particularly heavy, cargo barges can use a wharf in the small boat harbor.

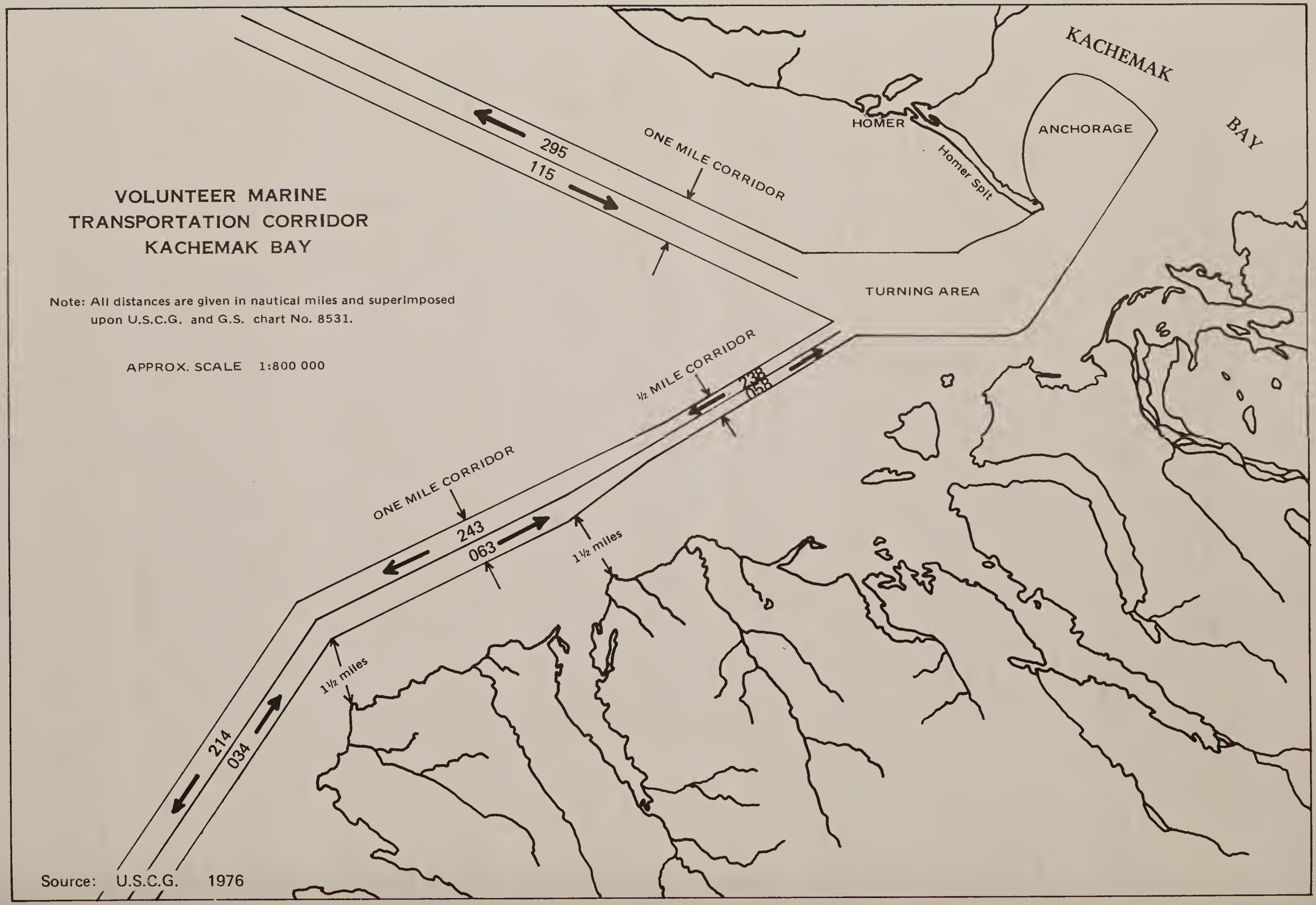
The historical figures for throughput tonnages, as shown on table III.C.6.c.-4 for the years 1966 to 1977, show an erratic pattern of tonnage handled. This is because in some years large shipments of a particular product such as sand, gravel, crushed rock, lumber, nitrogenous chemical fertilizer, or gasoline dominated the tonnage. If these large tonnages of particular products are removed, it is seen that Homer consistently handles 15,000 metric tons (16,500 tons) or less of goods per year through its port.

Drift River - Nikiski: Imports from foreign ports, mainly petroleum products, accounted for 64 percent of total inbound tonnage in 1977. Valdez shipped 28 percent of total petroleum and coal products imported. Tonnage from Kodiak to Homer consists of diverse products and accounts for 5 percent of tonnage imported into Homer. Of the outbound tonnage reported, 97 percent is shipped to foreign ports and consists mainly of lumber and chemicals and allied products The remainder of outbound shipments in 1977 had diverse destinations such as Seattle, Kodiak, Sitka, and the Alaska Peninsula.

Three separate groupings of facilities are discussed in this section--Kenai, Drift River, and Nikiski. Only those in Kenai are available for public use. Geographically, the ports of Kenai-Nikiski and Drift River are separate, but the Corps of Engineers' waterborne commerce statistics treat them as a single reporting unit. Drift River is located north of Kenai on the west side of Cook Inlet and Nikiski is located on the east side, north of Kenai. Kenai facilities include five wharves on the Kenai River, three of which are owned and operated by seafood companies.

The two facilities on the Kenai River which receive general freight are the city dock, owned by the city of Kenai, and the Port of Kenai wharf, which is privately owned. The city dock consists of a single 30.4-meter (100-ft) long

FIGURE III. C. 6. c.– 1



VOLUNTEER MARINE
TRANSPORTATION CORRIDOR
KACHEMAK BAY

Note: All distances are given in nautical miles and superimposed upon U.S.C.G. and G.S. chart No. 8531.

APPROX. SCALE 1:800 000

Source: U.S.C.G. 1976

Table III.C.6.c.-4
Vessel Trips, Passengers and Throughput Tonnage - Homer

Year	Vessels	Passengers	Metric Tons
1966	676	2,328	12,529
1968	586	3,123	15,807
1970	2,337	5,074	172,136(1)
1972	2,871	7,052	154,567(2)
1974	142	10,511	10,831
1975	1,217	11,215	35,633(3)
1976	138	10,869	27,906(4)(6)
1977	162	9,559	107,564(5)(6)

Notes: (1) 150,773 metric tons (166,200 tons) = sand, gravel, and crushed rock.

(2) 36,903 metric tons (40,679 tons) = logs; 97,182 metric tons (107,126 tons) = rafted logs.

(3) 21,452 metric tons (23,647 tons) = gasoline.

(4) 13,564 metric tons (14,952 tons) = nitrogenous chemical fertilizer.

(5) 52,009 metric tons (57,331 tons) = nitrogenous chemical fertilizer; 26,922 metric tons (29,677 tons) = kerosene; 10,587 metric tons (11,760 tons) = logs.

(6) Chemical fertilizer, although included in totals for Homer, originated at Nikiski. Homer is listed because it was the last port-of-call before a vessel sailed to a foreign port.

To obtain short tons, multiply metric tons by 1.1.

Source: Department of the Army, Corps of Engineers, 1966-1977.

bulkhead (concrete wall) which has been backfilled. The draft at this port is only 0.3 meters (1 ft) at low tide, which limits its use to barges. Principal products received include drilling mud and other petroleum industry supplies. Winter ice conditions limit use of the facility to approximately 318 days (Federic Harris, 1978). The Port of Kenai wharf is located 403 meters (550 yds) from the city dock. It has a 111-meter (365-ft) face and receives construction materials and general cargo.

Nikiski and Drift River are specialized ports serving the oil and gas industry. Nikiski has three deep-draft loading docks and one shallow-draft facility. In addition to these, there is the Arness dock which consists of three World War II liberty ships sunk in low water so as to provide a breakwater and mooring surfaces for barges supporting offshore drilling operations.

The rig tender's dock (Port Nikiski) consists of a backfilled concrete bulkhead and is designed primarily to handle barges and small offshore platform service vessels. It has a 182.9-meter (600-ft) face with a 3.04-meter (10-ft) draft alongside. The two side faces of the dock are 137.2 meters (450 ft) long, and draft ranges from zero at the shore side to 3.0 meters (10 ft) at the inlet side.

Eight acres of landside storage area are available. Shore facilities include crawler cranes with 136 metric tons (150 tons) capacity, storage stations for bulk mud and bulk cement, and machine shops. Also, there are five fuel and water transfer stations designed for use by supply boats. The facility receives inbound barge freight, accommodates loading of supply boats, and is used by Tesoro for the loading of refined petroleum products into barges. The Tesoro traffic has diminished with the construction of the petroleum products pipeline to Anchorage. The rig tender's dock was built by Crowley Maritime for the dedicated use of the oil industry. Conversion to a public use facility would not occur without the concurrence of current users.

The three offshore loading docks are the Standard Oil of California (also known as Kenai-Pipe Line Company dock), the Phillips-Marathon, and the Collier docks. The Standard dock (Nikiski Wharf) is of steel pile and concrete construction. It has berthing space of 399.1 meters (1,310 ft) with draft alongside of 14.6 meters (48 ft). It is connected to the shore by one 61-centimeter (24-in) pipeline to an 800,000-barrel storage facility; one 50.8-centimeter (20-in) and two 35.6-centimeter (14-in) pipelines to another 800,000-barrel storage facility; and one 50.8-centimeter (20-in) pipeline to 323,000-barrel storage facility. Tankers supplying oil to the Standard Oil and Tesoro refineries dock at this facility.

The Phillips-Marathon dock (LNG Dock) located south of the Standard Oil dock is constructed of sheet piles and concrete and has a length of 320 meters (1,050 ft). It serves ships taking on LNG shipments. The draft alongside this dock is 12.2 meters (40 ft). It is connected to the shore with one 61-centimeter (24-in) LNG line to 225,000-barrel storage capacity and one 50.8-centimeter (20-in) and one 4016-centimeter (16-in) petroleum line to a 450,000-barrel storage facility.

The Collier Company dock (Collier Chemical Dock) is constructed of steel piles and concrete and the berth has a length of 333.8 meters (1,095 ft). The draft alongside the berth is 12.2 meters (40 ft). There is a 113,397-metric ton

(125,000-ton) capacity for storing bulk urea. This dock is connected by pipeline (one 30.5 cm (12 in) connecting to two 15.2 cm (6 in)) to a facility for storing anhydrous ammonia, whose capacity is 54,431 metric tons (60,000 tons) at -33.3° C (-28° F). Further, there are two pipelines, 25.4 centimeters (10 in) and 20.3 centimeters (8 in), which feed petroleum to a 171,000-barrel storage facility.

The Drift River Terminal, built in 1966 on the west side of Cook Inlet, has an offshore loading platform equipped with breasting and mooring dolphins. Dolphins are groups of piles, placed to both sides of the end of a pier for either fastening mooring lines or for resting the ship itself (breasting dolphins). Alongside the platform it has a draft of 18.2 meters (60 ft) and is capable of handling tankers up to 149685 dead weight metric tons (150,000 dead weight tons). There are two 76.2-centimeter (30-in) pipelines leading to an onshore tank farm for storing crude oil.

Two dock facilities will be constructed as part of the Pacific-Alaska LNG project, which will be located south of the existing Collier property. First, a construction dock will be built with 152.4 meters (500 ft) of berthing area to accommodate large ocean-going barges carrying plant modules. Interest has been expressed by Kenai in later using this facility for receiving general cargo. To serve LNG ships, a pier 671 meters (2,200 ft) long will be constructed to a mooring facility consisting of six dolphins (Federal Power Commission, 1976). Some dredging will be required on the south side of the docking area.

Table III.C.6.c.-5 shows the high and low capacity available at the ports of Kenai-Nikiski-Drift River by handling categories. The table also shows 1977 inbound, outbound, and throughput tonnages through these ports. From these figures it can be seen that considerable additional capacity exists for handling oil and gas products at these ports. During 1977, some 578 oil tankers and barges arrived in the Port of Nikiski-Drift River.

Water depth at the Port of Kenai is only 1 foot deep at low tide. Water depth at Nikiski and Drift River facilities is sufficient to handle medium-size tankers.

Freezing occurs in the Kenai River from mid-December to the first of April. Because of tidal currents and numerous shoal areas in Cook Inlet, pilots are required for deep draft ships destined for Nikiski, as well as other ports north of Homer. The annual average number of days available for shipping is 300 at Nikiski, Drift River Terminal, and the Arness dock, and 318 on the Kenai River (Harris, 1978).

An area extending from 40 yards to several hundred yards north of Nikiski dock has rocks. A shoal area about 5 miles in extent is 3.2 kilometers (2 mi) off the dock and is marked by a buoy.

Navigational difficulties and hazards to vessels in the Kenai-Nikiski area are due more to current and ice than storms and water depth. High tidal fluctuations produce strong currents which reach 8 to 11 knots in Cook Inlet and up to 6 knots at Nikiski docking areas. Drift River is adequately protected by the West Forelands from ice and current on the ebb tide. Deep water, wide shipping lanes, the required use of pilots on vessels above 272 gross metric tons (300

Table III.C.6.c.-5
Ports of Kenai-Nikiski-Drift River - 1977 Tonnages (short tons), Barrels and Capacities

Handling Category	(Short Tons) Inbound	Outbound	Throughput	Berth Occupancy High(1, 2) Capacity	V/C(3)	Low(1, 2) Capacity	V/C(3)
Containerizable	---	---	---	---		---	
RO/RO	---	---	---	---		---	
Special	28,553	---	28,533				
Neobulk	765	---	765	1,744,200	.04%	1,324,800	.06%
Dry Bulk	---	---(4)	---(4)	720,000	---	345,600	---
Liquid Bulk	---	5,527,681	5,527,681	34,948,250	15.8%	19,775,000	28.0%
LNG	---	---	---	16,875,000 (Bbls)	---	8,100,000 (Bbls)	---
Anhydrous Ammonia	---	---	---	12,825,000 (Bbls)	---	6,156,000 (Bbls)	---
Bulk Cement	---	---	---	979,200		806,400	
Total	29,553	5,527,681	5,556,999				

Notes: (1) Based on 318 available days in Kenai and 300 available days at Nikiski-Drift River.
(2) Port capacity is not a sum of capacities for each handling category.
Each capacity assumes berths will be used only for that handling category.
(3) V/C = Volume (total throughput)/Capcity
(4) Chemical fertilizer output reported for Homer but originating in Nikiski is not included.

Source: Frederic R. Harris, 1978; Peter Eakland and Associates.

gross tons), and the relatively small level of vessel traffic make navigation safe enroute to Nikiski. The principal safety issue relates to vessels approached or moored during the winter at Nikiski facilities, where they are exposed to strong flood tide currents containing heavy ice. Loading delays up to six hours due to such conditions have occurred at the existing LNG dock. Non-continuous ice floes up to 0.8 kilometers (½ mi) in diameter and up to 1.2 meters (4 ft) accumulate on the east shore of Cook Inlet during flood tides. The resulting forces on ships are sufficient to break mooring lines. In such cases, damage can occur to drifting vessels, as well as other vessels in the area. The danger, thus, does not relate solely to traffic levels at a given facility but to the extent adjacent facilities are in use at the same time. Construction of the proposed Pacific-Alaska LNG dock facility could increase this hazard.

To reduce the likelihood of damage, the Nikiski Marine Terminal Safety Committee has established voluntary procedures which include the following: mooring with the bow facing flood tides, providing adequate mooring lines, providing necessary engine room and bridge watches, and maintaining the capability to immediately suspend cargo operations and to cast off mooring lines (Federal Power Commission, 1976).

In 1977, over 99 percent of the total throughput tonnage handled at Kenai, Nikiski, and Drift River Terminal consisted of petroleum products. Most were exports of crude oil from Nikiski and Drift River Terminal. Inbound, commodities handled were special items (32% of total inbound tonnage), chemical products (16%), lumber products (7%), stone and allied products (4%), and primary metal products (3%). All tonnage is considered to be neobulk or special (Harris, 1978). The remaining inbound commodity types amounted to one percent or less of the total inbound tonnage. Inbound shipments of liquid bulk are limited because the two local refineries supply most local needs. The Tesoro refinery, which receives the State of Alaska's royalty oil, recently has been unable to operate at design levels because of lower production in Cook Inlet fields. To fill the gap in supply, oil from the Trans-Alaska pipeline is now being shipped to the refinery. The high sulphur content of Prudhoe Bay crude oil limits the percentage that can be used from this source.

D. Coastal Zone Management

1. State Coastal Management Program: The Alaska Coastal Management Program (ACMP) was initiated in 1974, in response to the opportunity for coastal planning provided by the Federal Coastal Zone Management Act (CZMA) of 1972 (Alaska Office of Coastal Management and U.S. DOC, 1979). The Alaska Legislature adopted an Alaska Coastal Management Act (ACMA) in 1977, as enabling legislation for submittal and adoption of the ACMP (AS 46.40.010, et. seq.). The ACMA establishes an Alaska Coastal Policy Council for policy guidance in administration of the ACMP. The Act requires borough and first class cities to prepare district Coastal Management Programs (CMP). It also establishes procedures for the development of the CMP in the Unorganized Borough and designates State lead agency's responsibilities for administration of the ACMP.

The Alaska Coastal Policy Council has adopted guidelines and standards for the use of coastal resources. These guidelines and standards are the principle regulatory component of ACMP. The Coastal Policy Council uses these guidelines

and standards for evaluating the acceptability of the district CMP and Coastal Resource Service Area Programs. In the absence of an approved district CMP for incorporated areas or a Coastal Resource Service Area Plan for an area in the unorganized borough, the State must refer to the Council's guidelines and standards along with other provisions of its approved ACMP to evaluate the suitability of proposed actions in the coastal zone.

The ACMP is not in itself a land and water use plan for geographically specific areas; the ACMP does not categorically allow and disallow specific types of actions in designated reaches of a coastal zone. Instead, the ACMP is a management process.

2. Energy Facilities Siting Process and Uses of State Concern: Of significance to this leasing proposal are provisions in the ACMP regarding the siting of energy facilities and the accommodation of land and water uses of State concern. The guidelines and standards of the Coastal Policy Council state in part that "sites suitable for the development of major onshore, nearshore, offshore, and outer continental shelf energy facilities must be identified by the State in conjunction with districts (6 AAC 80.070)." The approved State ACMP includes an "Energy Facilities Planning Process" as guidance for district coastal management programs in satisfying the above requirement (Alaska Office of Coastal Mgmt. and DOC, 1979).

The ACMA has separate requirements on uses of State concern of which energy facilities are an identified category (AS 46.40.210 (6); AS 46.40.060(a); AS 46.40.070 (c)). The ACMA requires a district CMP to, "not arbitrarily restrict or exclude uses of State concern (AS 46.40.060(a))." The Act sets forth three tests which must be met if a district program can reasonably restrict or exclude a use of State concern (AS 46.40.070(c)). These provisions in the ACMA, together with the Energy Facilities Planning Process of the ACMP, assure that siting of energy facilities in the coastal zone will be the subject of a rational planning process.

3. Kenai Peninsula Borough Coastal Management Program:

a. District Program Development: Most of the coastal area surrounding the proposed lease sale are a part of the Kenai Peninsula Borough. As such, coastal zone management authority under the Federal CZMA and the Alaska ACMP will eventually be exercised by the Borough. The Borough presently does not have an approved district CMP.

The Borough has completed the first year of a three-year funding assistance program for development, approval, and implementation of a district CMP. The Borough's first year efforts have resulted in an environmental atlas and resources inventory of the Borough's coastal zone (Environmental Services, 1979), a phase 1 background report (Environmental Services, 1979), and a phase 1 draft coastal management plan (Environmental Services, 1980).

The Borough does not intend to adopt or distribute for view the consultant's draft coastal management program immediately. Instead, the Borough will use its second year of funding assistance to solicit community opinion on coastal management policies. The Borough plans to conduct meetings in ten communities of its coastal zone. The citizens will be asked to evaluate the consultant's district CMP recommendations in addition to offering their own. The Borough

Planning Department will then formulate a district CMP based upon the input which it receives from the public meetings and hearings. The second year of district CMP development for the Borough is scheduled to run from April, 1980 to March, 1981.

The calendar dates for the third funding year of the Borough's CMP have yet to be established. The Borough would be eligible for implementation assistance of its CMP once its program is approved by the State legislature and it is incorporated into the State ACMP. The Borough's Planning Department presently intends to get a district CMP adopted by the Borough's Assembly in the fall of 1981. State review of the district program would occur in the fall of 1981 with legislative approval hoped for in January 1982.

b. Areas Meriting Special Attention: Kenai River Flats Proposal: Under provisions of ACMP, State agencies, or coastal resource districts may prepare an Area Meriting Special Attention proposal (AMSA)(AS 46.40.210(1); AS 46.40.040(1)(f); 6 AAC 80.160). The AMSA provisions in the ACMP provide for special consideration, in terms of planning and management, for discrete areas with specified characteristics. Once an AMSA is approved by the Coastal Policy Council or the District Coastal Management Plan is adopted by the legislature, then the specific management practices would be in effect.

The U.S. Fish and Wildlife Service (FWS, 1980) has proposed an AMSA for the Kenai River Flats area to the State Office of Coastal Management and the Kenai Peninsula Borough. The AMSA was proposed to protect wetland areas of the lower Kenai River drainage. These wetlands are significant for several reasons according to FWS (spring migration routes for snow geese, anadromous salmon spawning and nursery habitat, coastal flood plains and hydrologic recharge area, coastal geomorphic units which accommodate wave action, erosion, and storm damage, and an outdoor recreation and aesthetic appreciation area.

The FWS AMSA proposal would have the Kenai Peninsula Borough manage the Kenai River Flats area through the district CMP. The river flats would be divided into two land use categories--a "Conservation Zone" and a "Natural Areas Zone." The "Conservation Zone" would allow water dependent or water related land uses consistent with a district CMP for the Kenai Peninsula Borough. The "Natural Area Zone" would emphasize activities which do not disturb or alter the natural environment. Development activity which disturbs or alters the wetlands habitat and water quality of an anadromous fish stream would not be allowed. The FWS additionally proposes that some lands be publically acquired in the Kenai River area in order to preclude disturbances.

The Alaska Department of Fish and Game has proposed an AMSA for a portion of the Kenai River Flats area. This portion concerns State owned lands only (ADF&G, 1979). The State ADF&G proposal is comparable in land use management concepts to the FWS proposal.

c. Areas Meriting Special Attention: Homer Spit Coastal Development Program: The Kenai Peninsula Borough (KPB) has applied for CZM grant assistance from the State Department of Community and Regional Affairs to develop a AMSA proposal for the Homer Spit (Kenai Peninsula Borough, 1980).

According to the borough, the Homer Spit is a natural site for port and harbor facilities which are needed to attract and support the expanding fishing industry and to meet marine transportation needs. The spit is also located in a State designated critical habitat area; Kachemak Bay is highly productive for commercial shellfish species.

The AMSA proposal would provide a management scheme to minimize conflicts between marine transportation, port activities, and maintenance of the pelagic and benthic communities of Kachemak Bay. The AMSA product is expected to be a Homer Spit Coastal Development Program which would regulate land and water uses of the spit. The program, when completed, would be incorporated into the KPB district CMP.

The Homer Spit Coastal Development Program will draw upon work of the KPB Ports and Harbors Study (Woodward/Clyde Consultants, 1980), as well as the city of Homer's Port Development Plan (TAMS Engineers, 1980), to identify land and water use needs of the spit. Refer to section III.C.7.b. of the DEIS regarding land use for a discussion of the Port of Homer Development Plan.

d. Energy Facility Siting Analysis: Mention was made in section III.D.2. of the energy facility siting requirements in the ACMP. The KPB coastal management program will have to respond to the ACMP requirements. The borough has yet to adopt any official policies pursuant to these ACMP provisions. However, in the absence of official policies on energy facility siting, some guidance on possible policies as well as suitable sites in the borough's coastal zone can be obtained from studies sponsored by the borough.

Following OCS sale CI, the borough sponsored a study of the implications of OCS development for the Kenai Peninsula (CH2M-Hill, 1978). Although the analysis was directed to onshore impacts ensuing from OCS sale CI, the same types and locations of effects may be assumed for the proposed OCS sale 60, given the proximity of the lease tracts involved. The FEIS on OCS sale CI identified the following sites for a possible onshore facility locations (BLM, 1977):

Support Sites:	Nikiski, Homer, Seldovia, English Bay-Port Graham
Terminal Sites:	Drift River, Nikiski, Cape Starichkof, and Cape Douglas
Treatment Facilities Sites:	Tuxedni Bay, Cape Starichkof, Seldovia, English Bay-Port Graham
LNG Terminal Sites:	Nikiski, Cape Starichkof

The KPB study analyzed all of these sites in terms of environmental impacts, infrastructure requirements, cost considerations, industry preferences, and concerns of local and State officials. The study findings on siting onshore OCS related facilities include the following:

Support Base Activity:

-- During exploration and development phases of OCS activity: dock facilities at Nikiski, Homer, and Seldovia would be used to some extent.

-- Sufficient staging and storage facilities exist in the Kenai and Nikiski area to support exploration and initial development activities.

-- Some of the OCS support facilities would be moved to Homer in order to be closer to the lease area. Suitable industrial sites are available in the city of Homer, although acreage is presently not available on the Homer Spit and the City Dock.

-- Construction of new suppport facilities at Cape Starichkof may occur in conjunction with an oil terminal or processing facility being sited there.

Oil Terminals and Treatment Facilities:

-- Existing facilities at Drift River and Trading Bay might be expanded to treat and transport oil from the lower Cook Inlet.

-- On the east side of the Inlet, only two sites appear to be feasible; Nikiski and Cape Starichkof.

-- Any new oil terminal or treatment facility not located proximate to the Sterling Highway on the Kenai Peninsula would be dependent upon marine transportation. Hence, construction supplies and equipment would have to shipped from existing terminals and staging areas to such a new terminal.

Processing Facilities:

-- Both construction and operations of processing facilities--LNG plants and oil refineries--require ready access to labor and supplies. They will, therefore, probably be located on the east side of the Cook Inlet--where highway, marine, and air transportation facilities are available.

-- Nikiski is the most likely location for processing facilities, where at least a portion of the existing facilities could be used. The other potential site for processing facilities is the Cape Starichkof area.

-- Construction of processing facilities in the Homer-Kachemak Bay area would probably cause considerable public opposition.

Aside from the above findings, the KPB study recommended the following in regard to onshore facility siting:

-- Develop borough and city policies on locating new or expanded industrial facilities in Nikiski, Stariski-Cape Starichkof, Homer, and Seldovia. The policies should, in particular, consider limited dock and harbor resources, and conflicts between OCS, recreation, and fishing activities.

-- Adopt zoning controls or facility siting permit procedures for large scale industrial projects.

-- Review borough and city land leasing procedures to encourage stipulations on industrial uses.

The borough is currently sponsoring a Ports and Harbors Demand and Feasibility Study (Woodward/ Clyde Consultants, 1979). An objective of the overall project is to prepare a short range action plan and a long range master plan for ports and harbors development on the Kenai Peninsula. A key element in the project is the incorporation of OCS and energy demands into the borough's port and harbor planning. This project, when adopted by the borough, could be useful in its development of a district CMP; the analysis of future OCS development possibilities for purposes of port and harbor planning could be used to satisfy the energy facility siting requirements of the ACMP (personal communication, 1980).

An interim report of the project provides a schedule of possible improvement and new facilities to various port and harbor locations of the borough. OCS related improvements to these locations include the following:

-- Construction support base for new Pacific-Alaska LNG facility to be located at Nikiski.

-- Expansion to the existing Nikiski Rig Tenders dock with development of a new small, protected harbor north of the existing rig tenders dock. These improvements would partially serve offshore oil and gas operations in both the State and OCS (Federal) waters.

-- Construction of a new deep water port at Cape Starichkof, if a commercial find of hydrocarbons is made from either OCS sale CI or proposed sale 60. At least one mile of ocean frontage, extending landward to the Sterling Highway, should be zoned and reserved for oil related industrial development.

-- Expansion to the port of Homer to include a 30-acre industrial staging and storage yard to the north of the existing boat harbor. One of the functions served by this facility will be to provide a staging area for OCS support goods movement and storage.

-- Suggested improvements to other Kenai Peninsula ports do not include any facilities for OCS support purposes.

The schedule of harbor and port improvement does not imply a recommended program for KPB port and harbor development. The interim study instead considered three different combinations of improvements and changes to the various port and harbor facilities. These combinations reflect different levels of investment and policy assumptions on the borough and incorporated communities towards ports and harbors development. Only when the Ports and Harbors Master Plan is completed and adopted will the borough's policy on port improvements for oil and gas operations be officially expressed.

4. Kodiak Island Borough Coastal Management Program:

a. Program Development: The Kodiak Island Borough (KIB) has recently commenced a district CMP through receipt of grant assistance from the State Department of Community and Regional Affairs. The first phase the

borough's CMP will result in a plan to be conceptually approved by the Borough Assembly in the spring of 1981. Under its proposed schedule of coastal program development, the KIB would submit its district CMP to the State for review and approval in the fall of 1981, and for approval by the legislature in January of 1982.

b. Energy Facility Siting Analysis: Analysis of energy facility siting policies of the KIB-CMP is similar to that of the KPB. In the absence of offical CMP policies on energy facility siting, some guidance on possible policies, as well as suitable sites in the borough's coastal zone, can be obtained from studies sponsored by the borough.

The major difficulty with formulating hypothetical KIB energy facility siting policies, for purposes of comparison with the proposal's development scenario, is that the KIB sponsored studies are all predicated on a Western Gulf of Alaska lease sale rather than a Shelikof Strait lease sale. The KIB studies are useful to the extent that policy recommendations on OCS related industrial siting procedures can be identified.

In 1977, the borough sponsored an OCS impact study which was subsequently approved by the Borough Assembly as a "planning document" (Simpson, Usher, Jones, 1977; Personal Communication, 1980). This study produced findings and recommendations. Subsequent to this study, the KIB sponsored a regional plan and development strategy (Kramer, Chin, and Mayo, 1978), which incorporated the analysis from the earlier OCS impact study. This subsequent report has not been officially adopted by the Borough Assembly. However, the "Community Goals and Objectives" portion of the study has been officially adopted as borough policy. The goals and objectives pertinent to OCS facility siting on KIB lands are reproduced below:

Land Use Goal: To work towards eliminating existing conflicts in the land use patterns within the KIB, and to plan for low intensity development that preserves the land use integrity of residential areas, and concentrates commercial and industrial developments and strategic locations.

Objective: Develop a capability for stronger, more effective zoning enforcement.

Objective: Assure, in establishing zoning patterns, that land use category separations are located along natural and man-made boundaries that effectively buffer potentially conflicting land use districts from each other.

OCS Development Goal: To discourage the development of OCS related facilities in or around the population centers on Kodiak Island, and if OCS facilities are located anywhere on the Island, to require that they be concentrated in a limited number of locations as well as be self-sustained at their remote sites.

Objective: To prepare land use regulations that can effectively control the location of OCS related facilities including indirect and ancillary uses.

Objective: To prepare and adopt detailed OCS facility location policies and a fiscal planning process.

Objective: To encourage the oil industry to participate in funding efforts to mitigate the adverse impacts of their activites in the Kodiak Shelf.

Objective: To establish borough-wide environmental impact review and control procedures applicable to OCS related facilities in order to assure that the natural environment is preserved and enhanced throughout any future period of OCS development.

Objective: To investigate the feasibility of local government development and ownership of onshore OCS related facilities to be leased to the oil industry (Kramer, Chin, and Mayo, 1978).

The borough sponsored regional plan also analyzed OCS related industry activity. Findings and recommendations from this section of the regional plan include:

-- Enough feasible, environmentally acceptable, sites appear to be available that the borough can greatly influence the choice of a site. This finding derives from an oil terminal siting study done in anticipation of a Western Gulf of Alaska lease sale only (Woodward/ Clyde Consultants, 1977).

-- OCS related onshore development should be kept out of the urban area and villages. If possible, one of the Native corporations should receive some of the benefits associated with the provisions of onshore facilities. However, the door should be left open for possible joint development of a service base near the Kodiak urban area in view of the problems posed by the Pillar Mountain landslide and its proximity to the inner harbor.

-- The recommended strategy for dealing with OCS facilities revolves around two major points; 1) the borough, in cooperation with other local jurisdictions and groups, such as Koniag, can and should designate the feasible sites; and 2) the zoning ordinance should be amended to encourage development only on these sites, and in any case, under carefully designed conditional use procedures. The regional plan goes on to detail suggested revisions to the borough's zoning ordinance in order to accomplish these purposes.

A third study sponsored by the KIB examined candidate oil terminals sites on the Kodiak Archipelago in context of a Western Gulf of Alaska lease sale (Woodward/Clyde Consultants, 1977). This is the only facility siting study actually sponsored by the borough. This study was adopted as a planning document by the Borough Assembly (personal communications, 1980). However, the study findings do not constitute an official land use or energy facility siting plan for the KIB. The array of candidate oil terminal and OCS service base sites studied are shown schematically in figure III.A.-1. The siting study ranked the candidate sites based on various criteria.

Significant policy assumptions were entailed in the oil terminal and OCS support base site evaluation. These policies assumptions include the following:

-- Avoidance of existing community and harbor facilities. Terminal locations sited near such areas were presumed to adversely affect them and were scored negatively.

-- Avoidance of overland pipeline routes or minimum overland pipeline distance. Terminal locations using overland pipeline corridors were presumed to adversely affect terrestrial biological features and habitat; these were scored negatively.

-- Minimizing pipeline distance, either onshore or offshore. Terminal locations which were closest to the hypothesized producing fields (Western Gulf of Alaska) were presumed to beneficially effect the economic cost of petroleum development infrastructure. Such locations were scored positively.

-- Avoidance of critical marine habitat and pelagic/benthic communities for the bay(s) in which the marine terminal and pipeline landfall would be located. Marine species and habitat (through specific indicators) were presumed to be sensitive to and adversely affected by OCS marine terminal facilities siting. Site locations with these adverse impacts were scored negatively.

The KIB recognizes that its 1977 study on facility siting done for a proposed Western Gulf of Alaska lease sale must be updated to include the Shelikof Strait and Chiniak Bay areas. The borough has submitted applications for funding assistance under the Coastal Energy Impact Program for new facility siting studies in the Shelikof Strait and Chiniak Bay areas (Kodiak Island Borough, 1980).

E. Water Quality

1. Marine Water Quality Criteria: The management objectives for water quality of the U.S. oceans are set forth in the Clean Water Act as amended (33 USC 1251, et. seq.). The U.S. EPA has promulgated water quality criteria by type of receiving water, beneficial use, and water quality constituent pursuant to this act (33 USC 1312). The water quality criteria used in this section draw upon those promulgated by the EPA (EPA, 1976), as well as recommendations of the U.S. National Academy of Sciences (NAS, 1972).

Under the Clean Water Act amendments of 1977, EPA was given authority to promulgate ocean discharge criteria based upon water quality considerations for marine receiving waters (33 USC 1343(c)). EPA published proposed rules for ocean discharge criteria; however, these are under review and have yet to be officially promulgated (40 CFR 125, Subpart M (new); 45 FR 9548). Under the proposed rules, EPA would not specify numerical marine receiving water limitations for various pollutants. Instead, the EPA rules would require permit applicants to show that the concentration and type of contaminants in discharges would not adversely affect the marine environment.

The discussion of marine water quality in the proposed lease area involves a comparison of reported baseline concentrations against established or putative Federal water quality criteria and the State of Alaska water quality standards. Both Federal and State water quality management does not require evaluation of marine sediment quality or bioaccumulation of marine biota as indicators of marine water quality. Clearly, pollutant species move between these receptor types in the water column. Other sections of this DEIS acknowledge this interaction and its significance on marine and terrestrial biota. Sections IV.A.2.a. through g. consider bioaccumulation of contaminants in marine and terrestrial biota.

2. Trace Metal Concentrations: The following elements are considered to be the most toxic of the trace metals: chromium, copper, nickel, cadmium, mercury, lead, and barium (Clark, 1978; Ketchum, 1973). However, there is disagreement on the exact order or relative importance of toxic metals because of presently limited understanding of marine pollutant concentrations and processes (Burrell, 1977). The above cited elements are either naturally occurring in crude oil or formation waters or are present in drilling fluid discharges in concentrations greater than the established marine water quality criteria.

Table III.A.2.c.-1 summarizes the water quality data for selected trace metals in comparison with established Federal receiving water quality criteria. The baseline concentrations of the trace metals constituents were sampled along transects in the lower Cook Inlet and the Shelikof Strait waters extending out to the Kodiak shelf. Refer to figure III.A.2.c.-1. Data in the table show that the highest reported concentrations for cadmium, lead, copper, selenium, and chromium are below the applicable Federal water quality criteria. Some of the reported concentrations of zinc were close to the Federal criterion of one part per billion (ppb).

Concentrations of vanadium are included in the table, even though this is not considered to be a toxic substance by U.S. EPA pursuant to section 307(a)(1) of the Clean Water Act as amended. Additionally, EPA has not promulgated a water quality criterion for this trace metal. However, vanadium is naturally found in petroleum and, hence, is of interest as a possible indicator constituent in water column chemistry and monitoring of marine water quality. OCSEAP sampling of trace metals did not include barium or nickel in the transects shown in figure III.A.2.c.-1. The background concentration of these elements in seawater is on the order of micrograms per liter (ug/l) or parts per billion (Clark, 1978; Bowen, 1966).

3. Hydrocarbon Concentrations: Evaluation of the existing marine water quality for hydrocarbon constituents is complicated by the several types of hydrocarbons present, their relative toxicity to pelagic communities, and the difficulties in separating out toxic hydrocarbon groups through analytical tests (National Academy of Sciences, 1973; Malins, 1977; Trasky, 1977; and Alaska DEC, 1979). The State of Alaska has commented on this issue in its rationale for a hydrocarbon limitation in territorial receiving waters:

> "The U.S. Environmental Protection Agency recommends using a safety factor of 0.01 of the lowest LD50 of the most sensitive fresh water or marine species of life stages tested in establishing allowable hydrocarbon levels in the aquatic environment (EPA, 1976). Given an average lethal value of 1.0 ppm for sensitive Alaskan organisms, a standard of 0.01 ppm (10 ug/l) was established by ADEC for total aromatic hydrcarbons... [T]otal hydrocarbon (TH) concentrations in the water soluble phase are generally proportional to total aromatic hydrocarbons (TAH) concentrations in the same test solution (Anderson, 1977; Rice, Short, and Karinen in Wolfe, 1977). This toxicity ratio (TH:TAH) is roughly 1.5:1 for crude oil using various fish species as test organisms. Applying this average ratio, an allowable level of 15 ppb (ug/l) total hydrocarbons (using infrared analysis) was adopted for the aquatic environment [by AEDC].

The rationale for setting both a TH and TAH standard is partially based on available comparable data: The laboratory data base for acute and sublethal levels is primarily reported at TH (using infrared analysis), while TAH has recently been recognized as more closely characterizing the toxic water soluable fraction of petroleum hydrocarbon solutions. As the field and laboratory data base for TAH expands, it anticipated that the TH standard will be revised or possibly dropped (ADEC, 1979)."

Table III.E.3.-1 summarizes observations of dissolved hydrocarbon concentrations in Cook Inlet waters. The table reports the hydrocarbon material analyzed in two groups, referred to as "Fraction 1" and "Fraction 2". The first fraction consists of saturated and olefinic hydrocarbons. The second fraction contains larger and more extensively unsaturated hydrocarbons, aromatic hydrocarbons (if present), and some non-hydrocarbon organic compounds. These two fractions could be added to estimate total hydrocarbon concentrations. However, the additive concentrations of Fractions 1 and 2, as measured, could significantly underestimate the dissolved TH concentration which has been established as a State water quality standard.

The data in table III.E.3.-1 show that the individual hydrocarbon fractions were all below 1 ppb, with the exception of one observation. If the reported Fraction 1 and Fraction 2 concentrations are added at each of the sampling stations, the resulting concentration would still be at least an order of magnitude (10^1) less than the State standard for TH. However, hydrocarbon groups not measured in the Fractions 1 and 2 sampling could raise the true concentrations of dissolved TH at these sampling stations closer to the State water quality standard.

The dissolved aromatic fraction of hydrocarbons is considered to be more significant for purposes of water quality management (Alaska DEC, 1979; Shaw, 1977). Although the "Fraction 2" measurement of hydrocarbons could incorporate dissolved aromatic hydrocarbons, this measurement is not precise with the technique used (Shaw, 1977). Better methods for measuring toxic aromatic hydrocarbons involve gas chromatographs of individual toxic compounds. Investigators have recognized that two aromatic hydrocarbon compounds are expected to play a significant role in overall toxicity--benzene and toluene (National Academy of Sciences, 1973; Caldwell, Caldarone, and Mallon in Wolfe, 1977).

Table III.A.2.c.-4 summarizes observations on specific aromatic hydrocarbon compounds for sampling stations in Cook Inlet waters. The data in table III.A.2.c.-4 show that the values for benzene, toluene, and C_2 benzenes were in the range of low nanograms/liter (ng/l) or parts per trillion (ppt). Figure III.E.3.-1 shows the location of the sampling stations and the interpolated dissolved benzene concentration intervals in upper Cook Inlet waters. This sampling of aromatic hydrocarbons is significant for purposes of assessing the level of some toxic hydrocarbon contaminants in Cook Inlet waters because the sampling grid was located in the vicinity of existing petroleum production platforms. Figure III.E.3.-1 superimposes the location of existing production platforms in Trading Bay and between the western East Forelands.

No State water quality standards or Federal water quality criteria have been established for benzene or toluene hydrocarbon compounds. However, available toxicity studies of these two compounds show LD50 responses of test species to

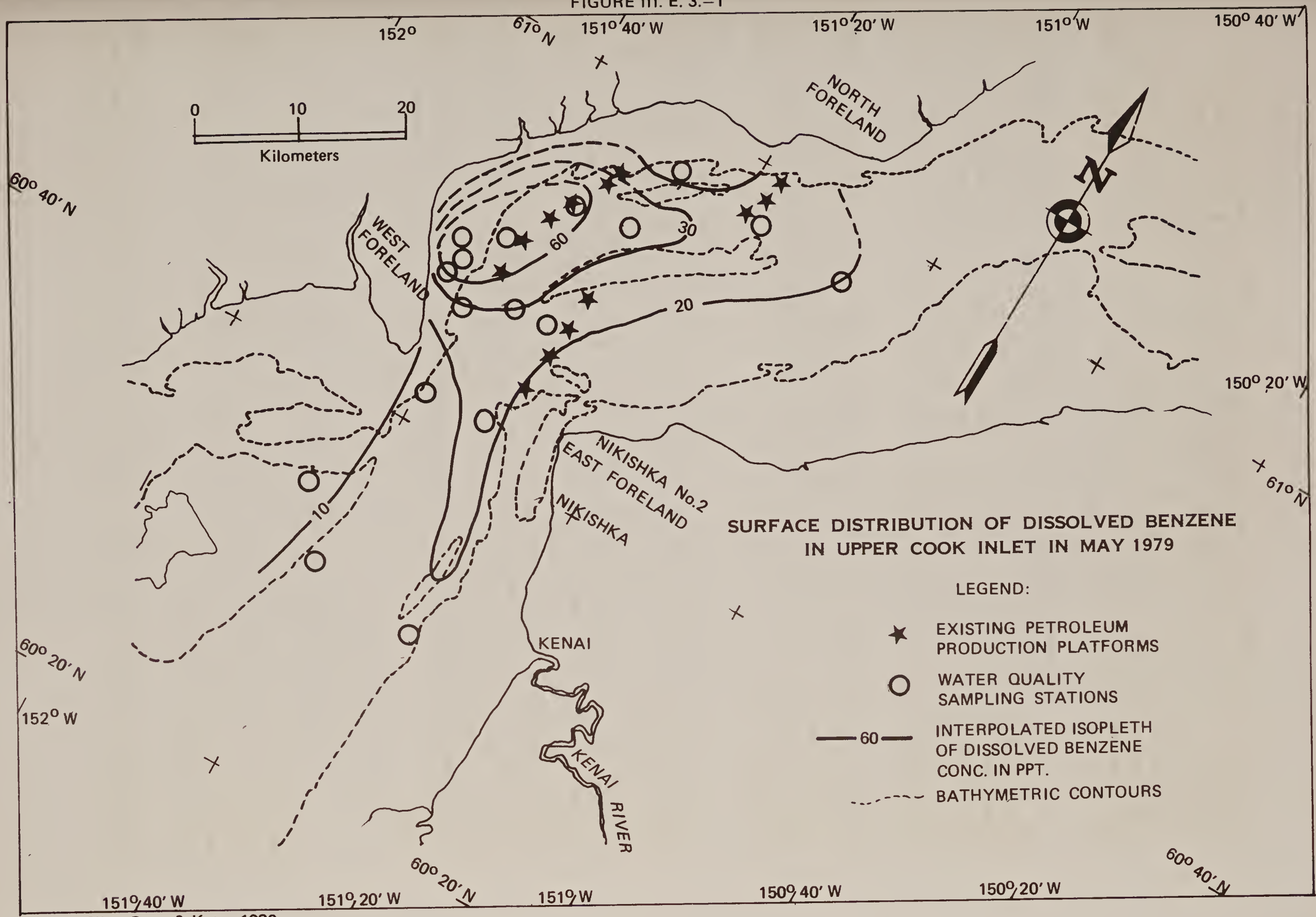
Table III.E.3.-1
Hydrocarbon Concentrations in Water From
Cook Inlet, Alaska, 1976

Station Position		ug/Kg (ppb)	ug/Kg (ppb)
Latitude	Longitude	Fraction 1	Fraction 2
59°03.1'N	151°52.4'W	0.17*	0.05
59°03.25'N	152°41.2'W	0.71*	0.41
59°03.1'N	153°23.4'W	0.46*	0.21
59°17.7.'N	152°07.7'W	0.14*	0.04
59°17.2'N	152°41.1.'W	0.02*	0.29
59°17.2'N	153°14.1'W	0.12* NB	0.10 NB
59°42.7'N	151°07.4'W	0.33*	0.04
59°34.2'N	151°25.4'W	0.50*	0.61
59°33.2'N	151°36.4'W	0.25*	L
59°35.4'N	151°49.7'W	0.52*	0.20
59°35.3'N	152°09.8'W	0.30*	0.39
59°35.25'N	152°29.8'W	0.38*	0.26
59°35.25'N	152.49.8'W	L	L
59°35.2'N	153°16.7'W	1.02*	0.44
59°46.2'N	152°08.7'W	0.76*	ND
59°46.3'N	152°45.3'W	0.41*	0.13
60°01.2'N	151°53.2'W	0.11*	0.91
60°01.2'N	152°01.9'W	0.15* NB	0.16 NB
60°01.3'N	152°21.1'W	0.20*	0.15
60°01.2'N	151°31.4'W	L	L

L = Lost during sample prepartion
ug/Kg = ug of sample detected per Kg surface water extracted
NB = Niskin bottle extraction was performed
* = Adjusted from 61.52% recovery of PHR spike addes, standard deviation 18.24
ND = None detectable

Source: Shaw, D., 1977.

FIGURE III. E. 3.–1



Source: Cline, Bates & Katz, 1980

be in the low ppm (National Academy of Sciences, 1973; Caldwell, Caldarone, and Mallon, 1977). Assuming an LD50 effect at 1 ppm, and a water quality standard of 0.01 of this value (or 1 ppb), the reported range of benzene values in table III.A.2.e.-4 is at least two orders of magnitude (10^2) less than this hypothetical standard/criterion for benzene. The same finding on marine water quality of toluene as a dissolved aromatic hydrocarbon in Cook Inlet can be made assuming a LD50 value for test species in the low ppm range (National Academy of Sciences, 1973).

4. Synthetic Organic Chemical Concentrations: No baseline data are available for Cook Inlet waters for various synthetic, organic chemicals which are toxic to pelagic communities and/or man. Included in this group of compounds are pesticides, herbicides, chemical additives for industrial processes, etc. The EPA has announced a list of 65 toxic substances, most of which are synthetic/organic compounds for which separate affluent limitations or prohibitions will be prepared under the Clean Water Act, as amended (EPA, 1978; 33 USC 1317(a)(1); 44 FR 4108).

Existing concentrations of synthetic, organic constituents in the water column of Cook Inlet are presumed to be low because of the absence of major point and non-point sources. According to NAS, the toxic thresholds for mammals and aquatic organisms are in the order of parts per million in concentration, or 10^6 or more times the known level in the marine environment (National Academy of Sciences, 1973).

5. Existing Wastewater Discharges in Cook Inlet: Major sources of wastewater discharges exist in the Cook Inlet: municipal waste, discharges of petroleum production platforms operating in territorial waters of upper Cook Inlet, discharges from commercial fishing vessels, ocean-going vessels, and hydrocarbon carriers. The stationary sources of discharge are regulated by the EPA under the National Pollution Discharge Elimination System (NPDES) pursuant to the Clean Water Act requirements. EPA stipulates numerical limitations on discharge constituents, flow rates, and discharge locations in order to minimize adverse effects upon beneficial uses of receiving waters. Discharges of sanitary wastes from commercial vessels and petroleum ballast waters from tankers is regulated by the U.S. Coast Guard. Refer to section IV.A.2.o. regarding the impacts of the proposal on marine water quality for discussion of the magnitude of wastewater releases, the regulated contaminants involved, and compliance with State and Federal water quality management programs.

F. Air Quality

1. Air Quality Management Programs: Pursuant to requirements of the Clean Air Act as amended, the State of Alaska has prepared a State Air Quality Control Plan (Alaska Department of Environmental Conservation, 1980). This plan divides the State into Intrastate Air Quality Control Regions (AQCR), reports on air emissions and air monitoring trends, projects future conditions, and includes control strategies for attainment and maintenance of State and Federal ambient standards.

The proposal is situated within the Cook Inlet Intrastate AQCR, as well as the Southcentral Alaska AQCR. State ambient air quality standards are summarized in table III.F.1.-1. The Federal ambient standards are not shown because the

Table III.F.1.-1
State of Alaska Ambient Air Quality Standards
Measured in ug/m^3

Criteria Pollutant	Averaging Time: Annual[c]	24-hr	8 hr	3 hr	1 hr
Total Suspended Particulates	60[a]	150	--	--	--
Class II[f]	19[a]	37	--	--	--
Class I[f]	5[a]	10	--	--	--
Carbon Monoxide	--	--	10,000	--	40,000
Ozone	--	--	--	--	235
Nitrogen Dioxide	100	--	--	--	--
Lead	1.5	--	--	--	--
Sulfur Oxide	80	365	--	1300	--
Class II[f]	20	91	--	512	--
Class I[f]	2	5	--	25	--

Source: 78 AAC 50.020; Alaska Dept. of Environmental Conservation. 1980; 40 CFR 52.21 (43 FR 26388).

a = Annual geometric mean.
- = No standard for exposure interval indicated.
b = Measured as sulfur dioxide.
c = Annual arithmetic mean.
d = The State's ozone standard compares with U.S. EPA standards for photochemical oxidant(s) which are measured as ozone.
e = Quarterly arithmetic mean instead of annual.
f = The standards for Class I and Class II areas refer to the EPA Prevention of Significant Deterioration Program. The standards express maximum allowable increments in air quality attributable to proposed emission sources above baseline (existing) air quality conditions.

State standards are more stringent and air monitoring analysis shows compliance with State's standards for the most part.

Under provisions of the Federal Clean Air Act as amended, AQCRs within the State must be classified as to ambient air quality for those regions with ambient air quality superior to that required by the primary National Ambient Air Quality Standards (NAAQS): Class III areas are those in which the NAAQS are exceeded; these are "non-attainment" areas. Classes I and II areas are those in which ambient air quality is superior to the NAAQS, and in which maximum allowable increments above baseline concentrations are established. Class I areas include certain national parks, national wilderness areas, and national wildlife refuges which meet specified criteria (PL 95-95, Sections 160-164).

2. Air Monitoring Analysis and Compliance with State Standards: Ambient air quality in the Cook Inlet AQCR was reported by the U.S. EPA to be in compliance with all NAAQS with the exception of TSP (U.S. EPA, 1978) and carbon monoxide (CO) in the Anchorage area only. However, this finding was not predicated upon a review of monitoring data. Instead, EPA interpreted that area emissions inventory with known meteorological conditions.

Monitoring data on TSP for three Kenai Peninsula locations is summarized in table III.F.2.-1. This is the only published air monitoring data available for coastal regions in the vicinity of the proposed sale area. Additionally, air monitoring was done for a brief period in the coastal area between Kenai and Nikiski as part of the Pacific-Alaska LNG Facility site selection analysis (Dames and Moore, 1978). Ambient air quality observations for SO_2, TSP, CO, and nitrogen dioxide (NOX) at this site are displayed in table III.F.3.-1.

The TSP annual geometric mean values monitored at Kenai and Nikiski for the years 1975-1978 were in the range of background values for TSP (30-40 ug/m^3) suggested by U.S. EPA (EPA,1978). The TSP annual mean values monitored at Homer were slightly higher (60-70 ug/m^3) and violated the State standard for TSP. Table III.F.2.-1 also shows that the State TSP standard for 24-hour exposure was exceeded eleven times in 1978 at the Kenai and Homer monitoring stations while only once at the Nikiski LNG plant location.

An inspection of tables III.F.1.-1 and III.F.2.-1 shows that the air monitoring done at the coastal site north of Kenai yields low values in comparison to the State air quality standards: the mean values for SO_2, NOX, TSP, and CO were all fractions of the State standards. However, it should be recognized that these observations reflect air monitoring done only from September to December.

3. PSD Area Designations: Under the Prevention of Significant Deterioration program (PSD) of the Federal Clean Air Act, a Class I area has been designated on the west side of Cook Inlet. The Tuxedni National Wildlife Refuge on Chisik Island was considered by U.S. EPA to be suitable for a PSD Class I area designation. It should be noted that the proposed additions to the Tuxedni NWR along the western coast of Cook Inlet are presently not a part of the U.S. EPA designated Class I PSD area. Refer to section III.C.5. No air quality monitoring exists in the uninhabitated reaches of the western shorelines of Cook Inlet to establish baseline ambient air quality conditions near the Tuxedni NWR.

Table III.F.2.-1
Summary of Kenai Peninsula Air
Monitoring for Total Suspended Particulates[a]

Monitoring Locations	Annual Geometric Mean	Exposure Interval No. of 24 Hour Observations Exceeding 150 ug/m^3,[b]	Exposure Interval No. of 24 Hour Observations Exceeding 260 ug/m^3,[c]
Homer Fire Department			
1975	190	14	12
1976	61	5	2
1977	68	5	1
1978	69	11	3
Nikiski Phillips LNG Plant			
1975	36	1	1
1976	41	3	1
1977	23	1	0
1978	19	1	0
Kenai Fire Stations			
1975	48	2	1
1976	35	1	1
1977	34	2	0
1978	33	11	0

a All observations are measure in micrograms per cubic meters (ug/m^3).
b State ambient standard.
c Federal primary ambient standard.

Source: Alaska Department of Environmental Conservation, 1980.

Table III.F.3.-1
Summary of Nikiski Air Quality Monitoring Program

Pollutant	Monitoring Period	Concentrations (ug/m^3)[a] 1-hour Maximum	24-hour Maximum	Average
Sulfur Dioxide	10/05/78 to 12/15/78	26	--	0
Particulates	09/05/78 to 03/28/79[b]	--	253	10[c]
Nitrogen Dioxide	10/05/78 to 12/15/78	60	--	20
Carbon Monoxide	09/23/78 to 12/15/78	6850	--	1000

a. Based on measurements made in parts per million and rounded to the nearest whole number.
b. A total of 65 24-hour samples were taken at two separate locations.
c. Geometric Mean based on 65 samples.

Source: Dames and Moore, 1979.

Other Federally managed lands near the proposed sale area may be suitable for PSD Class I designation. Until Alaskan national interest lands legislation is enacted, and the discrete management status and boundary units are known, air quality PSD Class I designations would be speculative for purposes of environmental assessment in this impact statement.

G. BLM Studies Program

1. Environmental Studies Program: In each OCS area proposed for gas and/or oil development, extensive environmental studies are conducted before such development is allowed. As manager of the Outer Continental Shelf Leasing Program, the Bureau of Land Management (BLM) of the Department of the Interior (DOI) initiated the Outer Continental Shelf Environmental Assessment Program (OCSEAP) as an essential part of its management responsibility. The environmental studies program is conducted under interagency agreement between BLM and OCSEAP offices of the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce (DOC).

In 1974, BLM requested NOAA to initiate an environmental assessment program in northeastern Gulf of Alaska and eight additional Alaska Outer Continental Shelf areas. A studies program for lease areas and some nonspecific study areas in Alaska were planned. This program assembled historical data about the Alaskan Outer Continental Shelf and addressed new study needs to provide a basis for assessment of pretroleum exploration and development impacts.

Major study efforts began in 1975 in the Gulf of Alaska, including the Kodiak area. In 1977, studies began in the lower Cook Inlet/Shelikof Strait sale area 60. These studies were broad-scale surveys and produced information defining circulation patterns, seafloor faults, seismic activity, unstable sediment areas, critical habitats, and biological populations. Baseline data for hydrocarbon and trace metal concentrations were also provided. Special studies were intensified in fiscal year 1978 to fill data gaps in nearshore processes and to determine possible environmental impacts due to OCS development.

2. Objectives of the Alaska OCS Environmental Assessment Program: In July 1979, the Alaska OCS Office received an Interim Synthesis Report on the Cook Inlet/Shelikof Strait from Science Applications, Inc., through OCSEAP. The report contains considerable descriptive information on the affected biological and geophysical environment and represents a comprehensive encyclopedia for environmental information.

a. Contaminant Distribution: Marine chemistry efforts began in 1975 in the Gulf of Alaska and on the Kodiak Shelf. In 1977, contaminant studies were initiated in lower Cook Inlet/Shelikof Strait. These studies were intended to establish predevelopment hydrocarbon and trace metal concentrations along carefully designed station grids.

A significant part of the 1977 marine chemistry program was directed towards process orientated studies. These studies were designed to give insight into processes that control hydrocarbon distributions in the Alaska OCS and to answer questions of seasonal variability of pollutant concentrations in water, biota, and sediments due to biological activity or petroleum exposure. Rig

monitoring studies of toxicity of drilling fluids and cuttings on commercial shellfish was begun in FY 80. The results of these studies will be available in 1981.

b. Geologic Hazards: Geologic hazards to petroleum-related activities center around seismicity, surface, and near-surface faulting, sediment instability, erosion and deposition, and stratigraphy.

Many hazards present in Alaska lease areas also occur in other U.S. shelf areas; however, in Alaska, these problems are unique in terms of severity and complexity. A knowledge of the nature, frequency, and intensity of severe environmental events is essential.

Seismic field studies began in fiscal years 1975 and 1976 to supplement existing studies being funded by other agencies. The Bureau of Land Management is directly supporting part of the seismic program in an ongoing Geological Survey study, employing a land-based network of seismographic stations. All geohazard studies conducted by the University of Alaska have been funded through BLM/OCSEAP. The major objectives of these seismic studies are to determine a probability scale for earthquake hazards and to improve the statistical reliability of the existing data base. This is accomplished through continuation of present observational programs and use of additional or improved instrumentation, such as ocean-bottom seismometers and strong motion accelerometers. Sufficient geohazard information is available on Cook Inlet; an interim geohazards evaluation of Shelikof Strait will be available prior to the proposed lease sale 60.

Shelf faulting, and sedimentation studies are conducted in order to define potential hazards so that environmental risks can be minimized by out-right avoidance or by appropriate regulation of facility siting, design, and construction. Certain geologic features, identified as potentially troublesome during regional reconnaissance of the proposed lease area, are studied in further detail. The regional reconnaissance phase requires about a 2-year study effort. Focused studies on special problems take an additional 2 to 3 years. These are time estimates which vary depending upon the proposed lease area size, geological complexity, and nature of the identified hazards.

Shelf faulting and sedimentation studies began in fiscal year 1975. The studies have produced basic information on geologic hazards of the area, including location of probable active faults, potentially unstable sediments, and erosional and deposition areas on the shelf. The work is being continued through fiscal year 1980 to gather additional tract specific hazards information. Refer to sections III.A.1. and IV.A.1.g. for more detailed discussion about geologic hazards.

c. Pollutant Transport: Transport and transformation (weathering) of petroleum-related contaminants are significant considerations in an assessment of potential impacts of OCS developments. Petroleum and other contaminants introduced into the environment can be transported in the atmosphere, in the water column, and by sea ice. During transport, contaminants undergo continual physiochemical changes, such as evaporation, flocculation, emulsification, weathering, biodegradation, and decomposition.

Transport studies are designed to provide information that will enable the Department of the Interior and other agencies to 1) plan stages and siting of offshore petroleum development to minimize potential risks to sensitive environments, 2) provide oilspill trajectories, coastal landfall, and effects of oilspill cleanup operations, and 3) assist in planning the location of long-term environmental monitoring sites in the study area.

Prior to the Alaska Outer Continental Shelf Program, no systematic physical oceanographic studies were conducted on all the Gulf of Alaska Continental Shelf. No long-term direct measurements of coastal winds and currents had been performed. Transport studies were designed to proceed from a regional description of oceanographic and meteorological features to analyses of processes. Oceanographic investigations included literature summaries, current measurements, hydrographic station data, remote data sensing, and computer modeling. Meteorologic studies have concentrated on field observations and computer simulation of coastal wind patterns.

Study efforts in fiscal year 1980 are devoted to analysis and synthesis of data, and continued modeling activities involving weathering, transformation, and spreading. The expected product will be a single report summarizing what is known about transport systems of the Cook Inlet and Shelikof Strait.

d. Biological Resources: A major reason for conducting biological population studies in the Cook Inlet/Shelikof Strait has been to determine which populations, communities, and ecosystems are at risk from either acute or chronic oilspills. The studies are intended to give insight into the cumulative risks to biological resources around Kodiak Island and in lower Cook Inlet. Distribution and abundance estimates, migration patterns, feeding sites, and population behavior are the first studies undertaken. The study results are used to determine potential vulnerability. Should vulnerability be indicated, detailed site-specific studies are undertaken. These studies focus on ecosystem processes, trophic and population dynamics, disturbance sensitiviy, habitat dependence, and physiological characteristics.

The first few years of biological studies have been concerned with the distribution and abundance of key species through reconnaissance surveys. For higher trophic levels, these studies identify critical habitats, migratory routes, and principal seabird and marine mammal breeding locations.

A few remaining reconnaissance studies will be completed in fiscal year 1980. These studies pertain to data gaps with respect to commercial fisheries, marine birds, and marine mammals, including endangered whales.

e. Effects: Effects research is ongoing, not tied to any one lease area. The research results are used to establish possible causal relationships between OCS-related perturbations and biological changes, and to form the basis for developing discharge regulations and operating stipulations. Also, the studies program is evaluating biological responses to stresses, in order to determine their potential usefulness as early warning indicators or monitoring aids in detecting and/or quantifying environmental changes.

Prior to 1979, most effects studies were conducted in the laboratory. However, in fiscal years 1979 and 1980, the emphasis shifted toward field studies. The field studies are designed to validate laboratory observations and to obtain

data on exposure concentrations and compositions likely to occur under various environmental conditions.

A bibliography of environmental studies completed in fiscal year 1979 can be found in appendix I.

3. Socioeconomic Studies Program: The socioeconomic studies program (SESP) of the Alaska OCS Office was created to determine and assess the potential onshore social, economic, and physical impacts from outer continental shelf oil and gas development. As a multiyear, multidiscipline program, the SESP conducts studies on the sociological and anthropological aspects of diverse groups. The SESP focuses on a longitudinal investigation of the development process, beginning from the assembly of predevelopment information to the monitoring of project development as it affects specific communities, regions, or the State as a whole. In addition, the program makes economic analyses of rural and urban communities, regions within the State, and the State as a whole, with assessments of both natural and man-made infrastructures.

The overall methodology is divided into three broad research components. The first component identifies an alternative set of assumptions regarding the location, nature, and timing of future petroleum events and related activities. In this component, the program takes into account the particular needs of the petroleum industry and projects the human, material, economic and environmental offshore and onshore development requirements of the regional petroleum industry.

The second component focuses on data gathering that identifies those quantifiable and qualifiable facts by which OCS-induced changes can be assessed. The critical community and regional components are identified and evaluated. Current sources of change and functional organization among different sectors of community and regional life are analyzed. Susceptible community relationships, values, activites, and processes are also included.

The statewide/regional analysis focuses on the statewide effects of cumulative and incremental lease sales and the distribution of these effects among certain defined subregions of the State. The local level analysis focuses on the direct effects of the lease sale on affected communities.

The SESP identified the study area for the lower Cook Inlet/Shelikof Strait petroleum development region to include the census divisions of Matanuska-Susitna, Anchorage, Kenai-Cook Inlet, Kodiak, and Seward. The following major study tasks were conducted.

a. Petroleum Development Scenario: Numerous oil and gas options were constructed through a combination of U.S. Geological Survey resource estimates and locational data from independent geologic assessment. A parameter economic analysis was conducted to assess their economic viability. These scenarios were then detailed according to technology; facility, material, and manpower requirements; and scheduling. Four different levels of petroleum development were prepared.

b. Statewide and Regional Population and Economic Forecasts: A non-OCS base case was developed that assumed no new significant oil, gas, or

other mineral development in Alaska beyond current commitments. Forecasts were then prepared for four different potential levels of oil and gas development. Forecasts to the year 2000 were made for population, employment, income, and State government fiscal impacts.

c. Impacts on Socioeconomic and Physical Systems: Community facility standards were developed and applied to the non-OCS base case and each of the four oil and gas scenarios. The data included education, public safety, recreation and tourism, utilities, housing, and local government resources, investments, and capital needs.

d. Impacts on Transportation Systems: A methodology was developed and applied to assess impacts of the land-, air-, and water-related transportation modes. The ability of these modes to move goods and materials in and out of the region and throughout the State for the non-OCS base case and for the four scenarios was assessed.

e. Impacts on the Sociocultural System: Issues analyzed were traditional use of all resourecs including land, marine, and ice environments; subsistence; cultural values; politics; interethnic relationships; social health; and familty relationships.

From September 1976 until early 1980, Peat, Marwick, Mitchell and Co. had the responsibility to hire subcontractors to perform the work required for impact assessment. The following is a list of contractors who have conducted research tasks for the lower Cook Inlet/Shelikof Strait petroleum development region and impacted area: Peat, Marwick, Mitchell and Co.; Jim Lindsay and Associates; Dames and Moore; Peter Eakland and Associates; University of Alaska Sea Grant Program; Alaska Consultants, Inc.; Policy Analysts, Ltd.; Institute of Social and Economic Research; U.S. Coast Guard; the Pacific Northwest Forest and Range Experiment Station of the U.S. Department of Agriculture, Forest Service; Stephen R. Braund and Associates; University of Alaska Museum; James T. Payne and Associates; and Cultural Dynamics, Ltd.

H. Future Environment Without the Proposal

1. Social Factors: The following discussion is a forecast through the year 2000 of anticipated growth in Kenai, Soldotna, Homer, Kodiak, and Port Lions without the proposed lease sale. Sources of information for this discussion include: Alaska Consultants, Inc., 1980, Technical Report Number 46, Volume 2; Alaska Consultants, Inc., 1979, Technical Report Number 40; Kodiak Native Association, 1980, Overall Economic Development Program 1980; Kodiak Area Native Association, 1979, Five Year Regional Health Plan 1981-1985.

Kenai: Under the base case, growth impacts at Kenai are expected to stem from consolidation of its position in the economic functions that now support the community. Continuing economic growth is forecast, but with no noteworthy sudden departures from recent economic trends. The Kenai area will maintain its oil and gas and petrochemical base, drawing upon existing and yet-to-be proven hydrocarbon reserves anticipated from new State leases and sale CI. An additional LNG plant will be constructed, beginning in 1981. Expanded commercial fisheries and fish processing and tourism industries are expected to support some growth.

The pace of population growth, estimated to average just over 2 percent annually, is even slower than during the post-1970 period and is quite different from the explosive growth pattern of the 1960-70 decade. In sum, the base case projection envisions a diminished rate of economic and population growth for the City of Kenai. The population is forecast to rise from an estimated 4,755 in 1980 to 7,000 in 2000.

The projected base case growth is not expected to generate any exceptional growth-related burdens on Kenai's municipal facilities and services. The relatively easy pace of town growth since 1970 has enabled Kenai to catch up with the backlog of municipal needs that accumulated during the hectic expansion of the 1960's. Now, Kenai is generally better positioned to absorb without disruption such growth impacts as may occur in conjuction with another LNG plant project, sale CI, and other anticipated developments. On the whole, the forecast gradual growth is expected to generate demand for such routine improvements as expanded water supply, minor improvements and corrections to the sanitary waste system, a new landfill site, and additional fire station and recreational facilities.

Soldotna: Soldotna is estimated to grow at an annual average rate of about 4 percent under the base case forecast. This growth rate is slower than in the previous decade and much slower than the decade before that. Soldotna's growth is linked to its role as a residential community and commercial and service center for the Central Peninsula area upon whose overall economic vitality its own prosperity depends. It is not anticipated that any major new industrial employers will locate within Soldotna, although the city is expected to capture a part of the region's resident offshore work force for sale CI.

As Soldotna's population is estimated to increase by about 81 percent over the forecast period, the city should experience a trend toward a more urbanized community. The population of Soldotna is forecast to grow from an estimated 2,572 in 1980 to 4,667 in 2000. The major growth impact issues at Soldotna will likely be related to relatively routine matters such as the town's water supply problem, the already scheduled waste treatment plant improvements, development of a new sanitary landfill site, and construction of additional fire stations to service new development. In comparision to Soldotna's recent history, the forecast imposes only moderate physical growth management demands upon the city.

Homer: The economic base analysis indicates that the city of Homer's growth will be stimulated by a continuing dynamic economy during the forecast period. Strong growth in a number of different sectors is expected to contribute. Development of a groundfish industry in lower Cook Inlet waters will likely be based at Homer's port, which will also benefit from improved economic conditions in the traditional fisheries. Homer is also advantageously located to serve as the home community for some of the permanent offshore work force operating the fields developed in sale CI lease areas. Finally, Homer's continuing appeal as a tourism and recreation center can support further expansion in the trade and services sectors of its economy.

The net result of these factors is that Homer is projected to average growth at about 7.5 percent annually, for a cumulative increase of 153 percent over the forecast period. Homer's population is forecast to increase from an estimated 2,148 in 1980 to 5,429 in 2000. For a community of Homer's size, this is a high rate of sustained growth.

Homer's projected rapid growth, especially in comparison to its present size, can be expected to place some heavy demands upon the city for maintenance of community infrastructure and services. Particular issues of potential concern are residential land development, including the extension of utility services; additional water treatment capacity (the basic water supply appears adequate for the base forecast); major expansion of the sanitary waste treatment facility; development of a new sanitary landfill site; and expanded police and fire protection services, including additional jail facilities and fire stations. Also, growth in the fishing fleet and local fish processing industry is likely to necessitate further port development.

Kodiak: The base case forecast is for steady population growth in the Kodiak urban area at an average rate of over 5 percent annually and a cumulative increase of over 120 percent over the forecast period. The key economic activities in Kodiak's future will remain the fishing and seafood processing industries. Kodiak is well situated to expand into the bottomfishing industry as that new resource for Alaska's fishing fleet and processing industry begins to realize its potential. Also, the trend toward a more diversified year-round fishery is expected to continue.

Due to the existing locational pattern of harbor and processing plant facilities the city of Kodiak is forecast to strengthen its preeminent role as the center of the island's fishing industry. Thus, about two-thirds of the Kodiak area's population growth and most of the employment growth is expected to take place within the city. Kodiak is forecast to grow from an estimated 4,818 in 1980 to 10,229 in 2000.

Overall, the Kodiak urban area is estimated to more than double in population during the forecast period and, thus, about double in its general requirements for community infrastructure. According to the economic forecast, the growth trend will be steadily upward, without big population swings which would complicate community planning and development programs. On the other hand, there are a couple of elements in the community infrastructure which have historically been in short supply or may be costly to expand much beyond present capacities.

Despite recent residential construction activity, the Kodiak urban area continues to experience a general housing shortage. Housing accommodations are particularly short for seasonal and transient workers. This situation, unless alleviated, may inhibit the projected expansion of the seafood processing industry and detract from Kodiak's economic base growth.

Also critically related to Kodiak's economic growth are the cost and reliability of two basic utilities--water and power supply. At times, industrial water use, mainly for seafood processing, accounts for up to 95 percent of the city of Kodiak's water consumption. As the city water supply is even now sometimes overtaxed at periods of peak plant operation, it is clear that a major water development project is a prerequisite for Kodiak to achieve its full economic potential as a base for seafood processing.

Electric power costs are high in Kodiak for industrial and residential consumers alike. Power requirements are forecast to nearly triple. If the Kodiak Electric Association (KEA) is unable to develop a lower cost alternative to its existing diesel generated supply, then the price of power may prove to be another brake on Kodiak's economic gowth potential.

Finally, the Kodiak area can expect to face a steady stream of the public works projects routinely required to service its growing urban residential area, such as the construction of new school facilities and the extension of water and sewer systems to escape the pollution potential of poor subsoils and drainage.

In quantitive terms, the base case growth forecast projects that Kodiak's population will increase by an estimated 112 percent by 2000. The physical impact of this growth upon Kodiak's community infrastructure will clearly be substantial and will tend toward a more urban physical development pattern and lifestyle than is currently the case. The basic orientation of the town's economic base toward the fishing and fish processin industry is expected to persist. However, with the successful entry into large scale bottomfishing, the local fishing and fish processing industry should be characterized by high year-round levels of activity, essentially eliminating the seasonality normally associated with this industry.

Because the employment and population projections anticipate more rapid growth in the first half of the forecast period, the demand for additonal housing, community facilities and utilities, plus attendant pressures on local financial resources, should be felt most strongly during the next ten years. Although the city of Kodiak's fiscal position is now stronger than that of most Alaska municipalities, if it commits itself to major new public works projects to accommodate growth, the added debt service demands could compel it to tap new revenue sources.

Port Lions: Port Lions is estimated to grow at an annual rate of 3 percent under the base case forecast. This growth rate is slightly higher than other Kodiak Island villages and stems primarily from the community's expressed desire to attract new industry and the expanded housing availability which will encourage a larger proportion of the younger populace to remain in the community, rather than emigrate as has been the case in the past. The population of Port Lions is forecast to grow from an estimated 266 in 1980 to 481 in 2000. Even this moderate 3 percent annual growth rate is substantial on a community the size of Port Lions.

The most significant problem which the community faces during this period is a continuing housing shortage. While the 35 new housing units will provide substantial relief in the near future, this supply is not expected to sustain growth and by the early 1990's, the community will experience the same housing shortage it now has. Unless a means for increasing the housing supply is found, the shortage will become severe by the end of the forecast period.

Concurrent with the need to expand housing supply will be the need to expand other services such as water, sewer, electrical power, and police and fire protection. Without an expanded tax base, this could prove problematic for the community; however, the community has proven itself quite capable of attracting financial resources to meet its needs and this pattern can be expected to continue.

2. Economy:

a. State and Regional Economies: The future of the Alaskan State and regional economies in the no sale case is described in the following

publications: University of Alaska, Institute of Social and Economic Research (1980), Technical Memoranda 1 and 2 and Technical Report Number 42; U.S. Department of the Interior (1979), The Western Gulf of Alaska DEIS, OCS Lease Sale 46, and (1976) The Lower Cook Inlet EIS, OCS Sale CI. The State and regional impacts of the proposal are relatively minor, and the reader is referred to the above document for the State and regional "no sale" situation.

b. Local Economies:

Kodiak

The local Kodiak no sale case is described below and is derived from Alaska Consultants, Inc., Technical Report Number 40, 1979.

Industries: Historically, fishing and fish processing have been the foundation of Kodiak's economy. At first, the Kodiak fishery concentrated on the salmon harvest. Over recent decades, however, the trend has been toward use of other available stocks of fish and shellfish. Now, halibut, herring and herring roe, king crab, tanner crab, dungeness crab, shrimp, and other species are all harvested. Kodiak's fishing industry has thus steadily evolved from a seasonal salmon fishery to a more diversified year-round industry with suitably diversified fishing fleets and processing plants.

The no sale case economic forecast assumes that this trend toward diversification will continue. Most notably, the forecast assumes that Kodiak will lead an expansion of fishing effort and processing capability for bottomfish that will make Kodiak the center of bottomfishing and processing across the Gulf of Alaska. A 1979 study done for the State of Alaska by Denconsult estimated a potential annual domestic harvest of 149000 metric tons of groundfish in the Kodiak and Chirikof sectors of the Gulf of Alaska. Kodiak, already the region's premier fishing port, is advantageously located in relation to the Kodiak grounds and the grounds off the Alaska Peninsula and the Gulf of Alaska.

Compared to competing ports, Kodiak is a large settlement with an existing community infrastructure and a relatively large labor force. These various factors favor Kodiak's emergence as the region's leading port for the bottomfishing fleet and for bottomfish processing.

It is also expected that the traditional established fishing industry will gradually increase and prosper during the forecast period. In particular, it is anticipated that better scientific understanding and improved resource management practices will enhance and stabilize yields, allowing more efficient use of gear, plant, and labor force.

Another resource-based industry, which is expected to prosper, is the wood products industry. Under terms of the Alaska Native Claims Settlement Act, extensive timber lands will be transferred to private ownership of Native corporations and, presumably, harvested for revenue purposes.

The tourism and recreation industry is expected to show modest growth. Promotion of Kodiak's historical and recreational assets and improved visitor facilities should attract increased numbers of tourists, conventioneers, and vacationers to the Kodiak area.

The Kodiak Coast Guard station, currently a major military installation with about 980 military personnel and an on-base population of about 2,500 people, is forecast to remain at about its current strength. However, a modest increase is foreseen in civilian employment at the base.

Kodiak already has an unusually well-balanced trade and services sector for a town of its size, and it is anticipated that expansion of tourist and bottomfishing industries will reinforce the basic component of these sectors.

Employment: The no sale case future employment forecast for the Kodiak area estimates that employment will grow from 5,937 in 1978 to 10,628 by 2000 (Alaska Consultants, Inc., 1979). This is an overall increase of about 79 percent of equivalent to an average annual growth rate of about 2.7 percent. With the exceptions noted below, the structure of Kodiak's economy is expected to persist relatively unchanged.

The basic employment categories of manufacturing (largely logging and fish processing) and agriculture, forestry, and fisheries (largely fishing) are projected to grow by about 75 percent, accounting for about 40 percent of all employment growth in the forecast period and setting the pace for the secondary economy. Trade and services exhibit the fastest growth rate, together generating about 36 percent of all new jobs. Together, these four economic sectors provide about three-quarters of the Kodiak area's economic growth.

Mainly because the Coast Guard station, the chief public employer, is not expected to expand its operations, the overall role of public sector employment will decline from 33 percent to 23 percent of total employment by the year 2000. In fact, government is the slowest growing economic sector.

The remaining sectors of contract construction, transportation, finance, insurance and real estate, and mining comprise a minor, if essential, share of about 10 percent of the baseline employment and maintain that share through the forecast period.

The employment forecast is for the Kodiak area as a whole and does not yield a separate breakdown for the city of Kodiak and the rest of the road-connected area. Nevertheless, it seems reasonable to assume that most of the employment growth under the base case will be concentrated in or very close to the city itself, as that is where the seafood industry is already established.

Local Government Finances: In fiscal year 1977, the city of Kodiak obtained most of its general fund revenues from local sources. Sales taxes (36%), property taxes (16%), and a variety of service charges and miscellaneous other sources (26%) provided over three-fourths of the city's general fund income. Intergovernmental transfers, mainly Federal and State revenue-sharing, accounted for the remaining 22 percent.

For the future, it is assumed that the city's revenues will grow at the same rate as its population grow. By this standard, the city's 1978 general fund income of about $3,500,000 annually is forecast to climb to about $8,300,000 by 2000 (Alaska Consultants, Inc., 1979).

As for base case operating expenditures, it is assumed that the city will continue to maintain about the same level of services for the same level of

per capita cost as it does at present. About two-thirds of the projected growth in the base case is allotted to the city of Kodiak, so the brunt of the fiscal impact from growth will land upon the city. However, this impact will be tempered by the fact that the borough government administers and finances the local share of educational services as well as certain other areawide services (Alaska Consultants, Inc., 1979). Also, certain utility services in Kodiak, such as power and telephone, are financed and supplied through independent public and private utilities.

At present, the city's general financial position, in terms of its per capita debt, ratio of debt to valuation, property tax rates, and other indexes of fiscal soundness, is roughly equal or superior to the average of other Alaskan municipalities. However, if the city commits itself to major new public works projects to accommodate growth, then its added debt service demands may compel the city to tap new revenue sources.

Kodiak Villages

Without the proposed sale, the future of the six Kodiak villages is likely to bring little, or at least relatively modest, change within the forseeable future. Village employment is principally in commercial fishing which offers a high degree of flexibility and freedom in pursuit of subsistence lifestyles. Seasonality of employment is distinct, further reflecting a preference toward the rural, subsistence lifestyle. Employment in the commercial salmon industry is evidenced by the seasonality levels shown in table III.H.2.b.-1.

Of the six villages, all but Port Lions (built in 1964) are over 100 years old and at least two have been reported as being 2,000 years old. Rates of growth are of little significance given the small populations, and the length of occupancy for all villages except Port Lions. The estimated rate of growth for Port Lions is 3 percent per year, and 2 percent per year for the other five villages.

The higher rate of growth for Port Lions is due to the apparent desire of residents to encourage community growth. The growth oriented attitude is evidenced by project proposals in the Overall Economic Development Plan (KANA, 1978-80), the response of local residents to questions posed during the BLM/OCS scoping process, and the orientation of local government towards providing services and infrastructure for prospective business.

Kenai-Cook Inlet Census Division

The following forecast of the Kenai-Cook Inlet Census division and the city's future without the proposal is taken from Alaska Consultants, Inc., 1980, Technical Report Number 46. The reader is referred to this document for details not contained in this text.

The base case forecast of employment and population growth for the cities of Kenai, Soldotna, and Homer was derived from an overall analysis of the economy of the Kenai-Cook Inlet Census Division, which comprises the western half of the Kenai Peninsula Borough.

For the forecast period, anticipated trends in the region's economic base were assessed and, upon this assessment, sector-by-sector growth rates were projected for future employment in the Kenai-Cook Inlet labor area and the Homer labor area.

Table III.H.2.b.-1
Village Employment

Village	Workforce Estimate	Summer Employment	Year-Round Employment
Akhiok	40	32	5
Karluk	31	20	5
Larsen Bay	52	100	6
Old Harbor	190	100	13
Ouzinkie	64	55	6
Port Lions	166	52	26

Source: Kodiak Area Native Association, 1979. Five-Year Regional Health Plan.

Two events were segregated and treated as separate incremental contributors to the region's economic growth, apart from the economic base analysis: the first-generation OCS sale CI, and construction and operation of the proposed Pacific-Alaska LNG plant at North Kenai. The employment attributable to these two projects was individually estimated and then incorporated into the employment forecasts for the Kenai-Cook Inlet and Homer labor areas. Next, by use of a population/employment ratio, population estimates were calculated for the Kenai-Cook Inlet and Homer labor areas. Finally, each labor area's population estimate was subdivided among the cities and their respective hinterlands.

Thus, this base case forecast is not a non-OCS forecast. It does include a level of OCS activity corresponding to a medium level of exploration success in sale CI as well as a strong base level of oil and gas-related industrial facilities developed for earlier leases in Cook Inlet. This aspect of the base case assumes significance in the impact assessment of the petroleum scenarios since it presents a situation in which many sale 60 activities can draw upon industrial facilities with excess capacity due to the decline of earlier producing fields.

The sector-by-sector analysis of regional economic trends follows.

Oil and Gas: An inelastic demand for petroleum will exist throughout the planning period from 1980 through 2000 for Cook Inlet petroleum resources.

Although petroleum production from existing upper Cook Inlet oil and gas fields will be declining throughout the planning period, strong demand for domestic oil and gas production will result in tertiary recovery from these fields through the year 2000. In addition, new petroleum production is assumed from State leases in the Cook Inlet area (and from offshore leases in OCS lease sale CI). It is also assumed that the existing and forecast natural gas reserves are sufficient to maintain current levels of production throughout the forecast.

Any shortfall in crude oil production from Cook Inlet fields supplying Cook Inlet refineries is assumed to be offset by crude oil importation from other areas of Alaska or elsewhere. Thus, these facilities are assumed to operate at or above current levels throughout the planning period. However, substantial additions to processing capacity are not seen to occur during the period of forecast.

Possible declines in petroleum-related employment due to production from upper Cook Inlet platforms ceasing are assumed to be more than compensated for by increases in oil service industry employment resulting from servicing oil developments in other areas of the state.

Fishing and Seafood Processing: Growth in fishing and seafood processing employment is assumed to result from increased yields in the traditional fisheries of the Kenai-Cook Inlet area and successful entry and exploitation of deep sea fishing resources.

The harvesting and processing of deep sea fishery resources (or so called groundfish or bottomfish) are assumed to take place in the southern Kenai Peninsula area, particularly Homer. Also, some supply of bottomfish to offshore processing vessels by fishing boats based in this area is foreseen.

Although involvement in deep sea fisheries is forecast to result in substantial employment increases, the sum of the increase in employment in the fishing and fish processing sector is assumed to be even greater since the base which is vested in the traditional fisheries also is forecast to increase. These increases are based in part upon increased knowledge and experience by the State of Alaska in the management of traditional species such as salmon, king crab, tanner crab, and other species taken in this area. This more capable management will enable the regulatory authorities to stabilize the production of these fisheries and permit catches approaching optimum yields.

It is also assumed that further diversification of fisheries products with the addition of bottomfish as an example and the fisheries product mix in Cook Inlet plants, especially the southern Kenai Peninsula plants, will result in a substantial year-round operation with a more stable resident labor force in the fishing and fish processing sector.

Improved management and greater yields in Alaska's fisheries districts will continue to result in part from the 200-mile offshore limit imposed by the United States, and the recently agreed upon U.S./Japan treaty which limits Japanese salmon catches beyond the 200-mile limit.

Overall, it is assumed that the improved management of Alaska fishery resources gained through law, treaty, knowledge, and experience will result in a more dependable and larger harvest of fisheries resources during the period of this forecast.

Tourism and Recreation: The tourism and recreation industry is forecast to become a more significant factor in the economic growth to the Kenai-Cook Inlet area. General population growth, as forecast for the south-central region by the Institute of Social and Economic Research for a "moderate base case," together with increased visitor traffic to the Kenai Peninsula Borough originating outside the state, are expected to intensify use of the area's tourism and recreational assets. The tourism and recreation sector within the Kenai-Cook Inlet area is seen responding to this increased potential by providing the facilities and services necessary to support increased tourism and recreation.

The Kenai-Cook Inlet area will continue to attract a large share of the total visitor traffic originating from the Anchorage area. Especially important in attracting and accommodating visitor traffic will be the Homer area although all areas within the Kenai-Cook Inlet area will realize visitation increases.

Logging and Wood Products: Although the Kenai-Cook Inlet area contains substantial timber resources with major wood processing plants located at Jakolof Bay and Tyonek, conflicts with the fishing and fish processing industry and the tourist and recreation industry are seen as inhibiting factors to further growth.

Logging and wood processing currently occupy a small position in the economy and basic employment of the Kenai-Cook Inlet area and, despite the potential of this industry to expand, it is assumed to remain at current levels throughout the forecast period, for reasons noted in the preceding paragraph.

Government: A modest rate of growth is assumed to take place in basic government employment during the forecast period. Increases in resident population

and visitors, especially those engaged in tourism and recreation, are assumed to result in the need for more intensive management in areas of fish and wildlife. Additional basic Federal employees are seen to be needed to protect and manage the fish and wildlife within the Kenai Moose Range. Also, additional basic State employees will be required to protect the productive fish streams, rivers, and beaches of this area as well as to manage State Parks and recreational facilities provided to accommodate visitors.

Increased offshore activities in petroleum development and deep sea fishing as well as increased recreational boating will necessitate increases in U.S. Coast Guard employment. In the air, increases in fixed wing and helicopter traffic resulting from offshore development and general economic and population growth will result in increased basic Federal and State employment. It is assumed at the State and local level that substantial intergovernmental transfers, principally in the form of grant funds, resulting in basic employment within the Kenai-Cook Inlet area will be maintained roughly in proportion to increases in population within the area.

In summary, increases in basic employment during the period of the forecast are assumed to result from the same natural resource-based industries now supporting basic employment in the area. However, these industries are forecast to range further from the Kenai-Cook Inlet area in providing the products supporting basic employment. The fishing industry is forecast to range further into the ocean for bottomfish. The petroleum industry will move further out on the continental shelf to produce oil and gas and utilize more extensive methods to realize tertiary recovery from existing fields. And greater numbers of visitors will travel to the area from greater distances to enjoy tourist and recreation opportunities on the lands and waters of the Kenai-Cook Inlet area.

In the principal sectors, basic employment in agriculture, forestry, and fisheries is forecast to increase in the Kenai-Cook Inlet Census Division at 4 percent per year from 1979 to 1990 and 2.5 percent per year from 1991 to 2000. This increase is based solely upon growth in the fisheries with bottomfishing being a major factor. Since a large portion of the growth is forecast to take place through bottomfishing and through greater yields in the total mix of fish catches, the southern Kenai Peninsula area is forecast to experience greater growth. Homer area basic employment in agriculture, forestry and fisheries is forecast to increase at a rate of 5 percent per year from 1979 to 1990 and 3 percent per year from 1991 to 2000. On the other hand, basic employment in this sector in the Kenai-Soldotna area, where salmon fishing dominates, is forecast to increase steadily at 1.5 percent per year throughout the planning period.

Basic employment in manufacturing which is vested primarily in petroleum processing and seafood processing is forecast to increase at a modest 2 percent per year in the non-OCS forecast for the Kenai-Cook Inlet Census Division. (The inclusion of the OCS sale CI in the base case does not alter this growth since the same facilities and employment are used to process the petroleum production of sale CI. However, it results in maintaining a share of petroleum employment at current levels.)

Of course, basic employment growth varies for the area under study within the Kenai-Cook Inlet Census Division. The Homer area, whose basic manufacturing

employment is vested in seafood processing, is forecast to increase at 5 percent per year from 1979 to 1990 and 3 percent per year from 1991 to 2000. In the Kenai-Soldotna area, where petroleum processing employment dominates, basic employment is expected to increase at 2 percent per year throughout the forecast period.

Basic non-OCS employment in mining in the Kenai-Cook Inlet Census Division is located almost exclusively in the Kenai-Soldotna area and is almost exclusively petroleum industry related employment. This basic employment sector is forecast to increase by 1.0 percent per year in the Kenai-Soldotna area, whereas no employment is recorded in this sector in the Homer area.

The distributive industry sectors of transportation, communications, and public utilities, trade and services support basic non-OCS employment in the Kenai-Cook Inlet Census Division through provision of goods and services primarily to basic industries, visitors, transient fishing vessels and offshore petroleum operations.

Basic employment in transportation, communications, and public utilities is forecast to increase at 3.5 percent per year throughout the planning period in the Kenai-Cook Inlet Census Division. The Kenai-Soldotna area where this sector, especially in transportation, is extensively developed, is forecast to increase at 3 percent per year from 1979 to 2000. Some economies of scale are seen in this sector. The Homer area, with a less developed basic economy in this sector, is forecast to increase at 4 percent per year throughout the forecast period.

Activities in the trade sector and service sector are forecast to result in a basic employment growth of 3.75 percent per year in the Kenai-Cook Inlet Census Division. Primarily because of tourism and recreation, basic employment in the Homer area is forecast to increase at 4 percent per year while lesser involvement in the Kenai-Soldotna area will result in an annual growth of 3.5 percent for the length of the forecast.

Basic employment in the sectors of contract construction and finance, insurance and real estate facilitate the development of basic economic activities such as petroleum development. The basic employment in the Kenai-Cook Inlet Census Division is forecast to increase at 3.5 percent per year. Basic employment in the Homer area is somewhat higher at 4 percent per year in each of these sectors while in the Kenai-Soldotna area both sectors are forecast to increase by 3 percent per year throughout the forecast period.

The forecast for basic employment in the Government sector in the Kenai-Cook Inlet Census Division area as a whole and the Kenai-Soldotna and Homer areas is forecast at 3 percent per year throughout the period of the forecast.

The overall growth rate in basic employment for all industry sectors in the Kenai-Cook Inlet Census Division is estimated at approximately 2.8 percent per year, with the Homer area increasing at about 3.8 percent per year, and the Kenai-Soldotna area increasing roughly at 2.4 percent per year.

Secondary Employment: Since the existence of service employment is dependent upon expenditures of the basic sector, service employment can be derived roughly from basic employment through the use of a multiplier to elicit total employment. Total employment minus basic employment equals service employment.

The 1979 employment estimate by Alaska Consultants, Inc., derived from Alaska Department of Labor, Employment Security Division statistics for the Kenai-Cook Inlet labor area totaled 7,795. Estimates of basic and service employment were 4,451 and 3,344 respectively. Thus, the multiplier derived is 1.75. The multiplier appears reasonably representative of an area in which there is a mixture of stable, year-round industrial employment with high wage rates and seasonal activities with large transient work forces.

The sum of the basic employment in the industrial sectors for each of the years forecast multiplied by the multiplier of 1.75 produces the estimate of total employment for each year. Of course, there are many factors which could result in the multiplier changing. However, rather than speculating upon these changes, the multiplier is assumed to be constant throughout the forecast period.

Total Employment: Since the multiplier of basic to secondary employment is assumed to remain constant during the forecast period, the rate of increase in basic employment is equal to the rate of increase in total employment. Therefore, the Kenai-Cook Inlet labor area, in which total employment is forecast to increase from an estimated 7,795 employees in the 1979 base year to 15,794 employees estimated in the year 2000, is forecast to increase by approximately 2.8 percent per year.

The Kenai-Soldotna area is projected to increase from an estimated 5,075 employees in 1979 to 8,246 in 2000, or by about 2.4 percent per year. The Homer area is projected to increase by approximately 3.8 percent annually or from 1,621 employees in 1979 to 3,619 employees in 2000.

OCS Sale CI

Employment: The sale CI portion of the base case employment and population is derived from a petroleum scenario which is assumed to be representative of a medium find scenario for the current OCS lease sale CI medium find scenario.

Since sale CI concludes within the period of the base case forecast, the annual additions of sale CI employment and population to the non-OCS forecast result in higher annual averages and intermediate changes in the rates of growth, but do not alter the long-term growth rates from the 1979 base year to the end of the forecast period in 2000. However, sale CI is foreseen to assure the utilization of existing Cook Inlet petroleum facilities at or near capacity. Although no tertiary recovery is assumed in this scenario, should the level of production in the forecast result, there is a distinct probability of tertiary recovery under the assumption for the non-OCS forecast.

A forecast of employment related to the medium find scenario for sale CI is shown in Alaska Consultants, Inc., 1980, Volume II.

Proposed Pacific Alaska LNG Plant

Employment: In order to portray the proposed Pacific Alaska LNG facility as an element in the base case of employment and population, a scenario involving only the construction and operations employment was developed. The facility as currently proposed by the Pacific Alaska LNG Company is assumed to have a capacity of 400 million cubic feet per day. The timing and direct employment

required in the construction and operation of this facility were obtained from the Institute of Social and Economic Research (ISER), University of Alaska. These were used by ISER in the "Lower Cook Inlet, State-wide and Regional Population and Economic Projections." Construction is forecast to take place beginning in 1980, and concluding with a finished plant during 1983. Production is assumed to begin in 1984 and to extend at full production beyond the year 2000. (See Alaska Consultants, Inc., 1980 for spatial distribution of employment.)

Total Base Case Employment

Base Case Total Employment Forecast: This forecast is derived below from the non-OCS cases plus the CI and pacific LNG effects.

For purposes of forecasting future employment levels, an overall projection was first developed for the regional economy, that is, for the Kenai-Cook Inlet Census Division. Then, on the basis of past and anticipated economic trends, a share of the regional projection was assigned to the Kenai-Soldotna and Homer labor areas. Individual employment forecasts were not developed for each city in view of the high work force mobility within the economic subareas and in view of the fact that resident population, not employment, was the critical variable for estimating community impacts.

Kenai-Soldotna Labor Area: Base case employment in the Kenai-Soldotna area is projected to increase from 5,386 jobs in 1980 to 8,336 jobs by 2000. The pace of expansion is generally expected to be steady, with the exception of a strong surge in construction employment during the building of the proposed Pacific Alaska LNG plant scheduled for 1981-84. At peak, this project creates up to 1,323 direct jobs. Many of these short-term construction jobs are assumed to be filled by a temporary work force residing in camp facilities at the project site. Other noteworthy sectors of basic growth include continuing oil and gas development related to sale CI and to other State leases and the transportation industry.

Kenai's Local Government Finances: In fiscal year 1978, the city of Kenai obtained most of its revenue from local sources. Property taxes (42%), sales taxes (26%) and a variety of service charges and miscellaneous other sources (8%) provided over three-fourths of the City's general fund income. Intergovernmental transfers, mainly from Federal and State revenue sharing, accounted for the remaining 24 percent.

For the future, it is assumed that the city's revenues will grow at the same rate as its population grows. By this standard, the city's 1982 general revenue fund income estimate of $3,560,000 annually is forecast to climb to about $5,000,000 by 2000.

As for operating expenditures, under the base case, it is assumed that the city of Kenai will continue to maintain about the same level of services at about the same level of per capita cost as it does at present. Only about one-third of the projected growth in the Central Peninsula area under the base case is allotted to Kenai, so the brunt of the fiscal impact of growth on the city will be somewhat mitigated. Fiscal impact will be further tempered by the fact that the borough government administers and funds the local share of

educational services as well as certain other areawide services such as garbage disposal and hospital services. In addition, certain utility services in Kenai, such as power and telephone, are financed through independent public and private utilities.

At present, the city's general financial position in terms of its per capita debt, ratio of debt to valuation, property valuation per capita, property tax rates and other indexes of fiscal soundness are about equal to or poorer than the average of other Alaskan municipalities. This suggests that Kenai may have some difficulty financing future capital improvements within its existing fiscal framework and may, instead, have to rely on State and Federal grants to finance new facilities or develop new revenue sources.

Kenai's Economic Prospects: Under the base case, growth impacts at Kenai are expected to stem from consolidation of its position in the economic functions that now support the community. Continuing economic growth is forecast, but with no noteworthy sudden departures from recent economic trends. The Kenai area will maintain its oil and gas and petrochemical base, drawing upon existing and yet-to-be proven hydrocarbon reserves anticipated from new State leases and sale CI. An additional LNG plant will be constructed as scheduled. Expanded commercial fisheries and fish processing and tourism industries are expected to support some growth.

The pace of population growth, estimated to average about 2 percent annually, is even slower than during the post-1970 period and is quite different from the explosive growth pattern of the 1960-70 decade. In summary, the base case projection envisions a diminished rate of economic and population growth for the city of Kenai.

Soldotna's Local Government Finances: As of 1978, nearly five-sixths of Soldotna's general fund revenues were raised locally from property taxes (29%), local sales tax (30%), and miscellaneous other local revenue sources (24%). Only about 17 percent of general fund revenues were derived from intergovernmental transfers. Since 1974, the city's mil rate has fallen considerably from 20.20 to 16.10 mils, a trend which is probably related to a period of rapid expansion in the city's residential and commercial property tax base.

For the base case forecast, it is assumed that the city's revenues will increase at a rate proportionate to population growth. By this assumption, the city's 1982 estimated general fund revenues of about $1,913,000 will climb to about $3,165,000 by the year 2000, an overall increase of 65 percent.

Under the base case, it is also assumed that the city will maintain its customary mix and quality of municipal services and facilities and that its general fund expenditures will have to be maintained at about the same per capita level as prevailed at the outset of the forecast period. Thus, general fund operating expenditures are estimated to grow by 65 percent from about $1,618,000 in 1982 to $2,677,000 by 2000. Operating expenditures are projected to consume about 85 percent of general fund receipts, with the remainder available for capital improvements and debt service.

At present, the city's overall financial situation seems improved over recent years. The city's per capita valuation is now typical of middle-sized Alaska

cities, thanks to recent town development. However, it should be noted that Soldotna's role as a residential community and governmental and commercial center for the central peninsula area may help perpetuate an imbalanced and relatively disadvantageous property tax base structure for Soldotna. The city must rely heavily on residential and commercial development for revenues, since it does not have tax access to the highly valued industrial plants in the north Kenai-Nikiski industrial complex which employs so many of the area's residents.

The city of Soldotna now experiences a relatively high indebtedness ratio when the city's own debt is combined with the city's share of borough indebtedness. This situation, in conjunction with the above-mentioned imbalance in its property tax base, may place financial strain upon the city's debt capacity, if major capital improvements are needed during the forecast period.

Soldotna's Economic Prospects: Soldotna is estimated to grow at an annual rate of about 3 percent under the base case forecast. This growth rate is slower than in the previous decade and much slower than the decade before that. Soldotna's growth is linked to its role as a residential community and commercial and service center for the central peninsula area upon whose overall economic vitality its own prosperity depends. It is not anticipated that any major new industrial employers will locate within Soldotna, although the city is expected to capture a part of the region's resident offshore work force for sale CI.

Homer Labor Area: The employment forecast for the Homer area anticipates rapid, steady growth over the next two decades. Particularly strong advances are projected for the fishing and fish processing industry, partly as a result of exploitation of groundfish resources. The trade and services sector of the economy is expected to exhibit strong growth, due to expansion in Homer's tourism industry and diversification of the local service economy. Sale CI is potentially also a major growth factor: the medium find scenario assumed for that sale is estimated to generate as many as 407 jobs in the Homer area, about 14 percent of total local employment.

Overall, Homer area employment is forecast to more than double from 1,742 jobs in 1980 to 3,619 by 2000 (Alaska Consultants Inc., 1980).

Local Government Finances: As of fiscal year 1978, the most recent year for which data is available, local property taxes were the main source of general fund revenues for the city of Homer, providing about 55 percent of the city's general fund income. Various other local revenues account for another 9 percent of general funds while intergovernmental transfers account for the remaining 36 percent, better than one-third of all general funds.

As a general rule, it is expected that the city's revenues will increase in proportion to its population growth. By this standard, it is estimated that the city's general fund income of approximately $910,000 as of fiscal year 1978, will reach about $2,400,000 by the close of the forecast period, or an increase of about 164 percent.

In the base case forecast, it is also assumed that the city will maintain essentially the variety and level of public services at about the same relative level of per capita cost as it does at present. Thus operating expen-

ditures are projected to grow at about the same rate as general fund income. If this relationship between growth in revenues and expenditures persists, then the city should receive income in excess of operating needs to apply to capital expenditures and debt service. Also, if the city maintains its 3 percent sales tax, which is at present earmarked for debt service, those additional revenues may also be applied to capital improvement needs.

The city of Homer's present financial status appears to be representative of medium-sized Alaska municipalities in regard to its per capita assessed valuation and better than average in its ratio of bonded debt to valuation. This last factor is important, since it appears that the city may be called upon to sponsor public improvements for water supply and waste treatment in the near future to serve a rapidly growing population.

Homer's Economic Prospects: The economic base analysis indicates that the city of Homer's growth will be stimulated by a continuing dynamic economy during the forecast. Strong growth in a number of different sectors is expected to contribute. Development of a groundfish industry in lower Cook Inlet waters will likely be based at Homer's port, which will also benefit from improved economic conditions in the traditional fisheries. Homer is also advantageously located to serve as the home community for a substantial share of the permanent offshore work force operating the fields developed in sale CI lease areas. Finally, Homer's continuing appeal as a tourism and recreation center can support further expansion in the trade and services sectors of its economy.

The net result of these factors is that Homer, the smallest in population of the three cities, is projected to grow at the fastest rate, about 4.5 percent annually, for a cumulative increase of 153 percent over the forecast period. For a community of Homer's size, this is a high rate of sustained growth.

IV. ENVIRONMENTAL CONSEQUENCES

A. Environmental Impacts of the Alternatives Including the Proposal:

1. Basic Assumptions Used Regarding Causes of Possible Impacts Resulting from the Alternatives Including the Proposal: Under the terms of the proposed action a total of 349917 hectares (864,646 acres) would be leased for oil and gas exploration and development. For the other alternatives the considered lease areas are as follows: alternative IV, 154484 hectares (381,443 acres), alternative V, 126816 hectares (313,125 acres), and alternative VI, 154080 hectares (380,630 acres). Undiscovered recoverable resources resulting from the mean case of the proposed action are estimated by USGS to be 670 MMbbls of oil and 1.17 Tcf of natural gas.

Within the following sections, every effort has been made to quantify impacts which could result from this proposed sale. The mean case has been utilized to quantify probable development activity levels. In addition, mean variables have been used in measuring impacts. Therefore, it should be kept in mind that all figures are relative to the mean case. There are, however, many areas in which quantification of impacts is difficult due to lack of data and the variability of factors affecting any potential development.

Impacts described within this document are written with the view that all pertinent laws of the United States, including USGS Gulf of Alaska Operating Orders (see appendix C), would be in effect and would act to shape and/or mitigate impacts. Further, the discussion of cumulative effects contained in each impact section is based on the interrelationship of the proposed action and other major, current, and proposed projects. Section IV.A.1.h. contains a list and a discussion of projects considered in preparation of the cumulative effects sections.

a. Activities Associated With Exploration: It is assumed that 16 exploration and delineation wells may be drilled in the Cook Inlet and Shelikof Strait as a result of this proposed sale. Moderate exploratory drilling activity would take place during the initial 5 years (leases are presently issued for 5-year periods as set forth in 43 CFR 3302.2) with a maximum of three exploratory rigs working at any one time.

Vessels for drilling exploratory wells would probably arrive from a variety of regions (most probably offshore Canada, Gulf of Mexico, and the North Sea). Two types of rigs, jack-ups and semisubmersibles would probably be used. Once a drilling rig is in place and drilling commences, special muds are circulated through the well bore to provide pressure control, lubrication of the drill bit, and the removal of drill cuttings from the hole. (Amounts are shown in table IV.A.1.a.-1.)

Drill cuttings are composed of rock fragments and liquids contained in the geological formation through which the drilling bit travels. To remove the drill cuttings, drilling muds (fluid) from the reservoir are circulated down the hole (well) through the drill pipe. Drilling muds are passed out the drilling bit nozzle picking up drill cuttings, and returned to the surface between the drill pipe and walls of the bore hole and/or casing. At the surface, drill cuttings are physically separated from the muds by screening

Table IV.A.1.a.-1
Estimated Volume of Drilling Muds and Drill Cuttings
Exploratory Period

	Minimum Case	Mean Case (Alt.I)	Maximum Case	Alternative IV	Alternative V	Alternative VI
1/ Drill Muds	10395 mt (11550 st)	15120 mt (16800 st)	2740 mt (30450 st)	9450 mt (10500 st)	4725 mt (5250 st)	10395 mt (11550 st)
2/ Drill Cuttings	2846 m^3 (4125 y^3)	4140 m^3 (6000 y^3)	7304 m^3 (10875 y^3)	2587 m^3 (3750 y^3)	1294 m^3 (1875 y^3)	2846 m^3 (4125 y^3)

1/ Assumes 945 metric tons (1050 short tons) per well.

2/ Assumes 259 m^3 (375 y^3) per well.

mt = Metric Ton
st = Short Ton

Source: Geological Survey, 1980. BLM/Alaska OCS Office, 1980.

NOTE: For a discussion of muds and cuttings produced during the production phase of the proposal and each of the alternatives, please see tables II.B.1.a.-1, II.B.4.a.-1., II.B.5.a.-1, and II.B.6.a.-1.

and washing techniques. After the drill cuttings and drilling muds are separated, the drill cuttings are discharged to the ocean and the muds are returned to the mud tank for recirculation down the hole. Drilling muds that are not separated from the drill cuttings are discharged to the ocean.

Removal of drill cuttings from the hole is only one function of drilling muds. To obtain satisfactory results in the completion of any well, drilling muds serve a variety of functions. To receive maximum benefit from drilling muds at each hole, the mud engineers must change the drilling mud component as new physical information is found at deeper well hole depths. Discharges of drilling muds must comply with regulations found under OCS Order No. 7 (appendix C), and 40 CFR (Part 435, Section 435.22). Both of these regulations restrict the discharge of any drilling muds containing oil. Additionally, OCS Order No. 7 forbids the discharge of drilling muds containing toxic substances into the ocean waters. The Geological Survey, Conservation Division, states if any oil-based muds are used, the muds would not be released into the ocean, and cuttings would be cleaned or barged to shore for disposal. Currently, the only mud components used to make up drilling muds that must be registered with the Environmental Protection Agency are bacteriocides.

In drilling, the volume of drilling muds and drill cuttings is dependent on the well and the hole size; both dictated by the well casing program. The estimation of the volume of both drilling muds and drill cuttings for the exploration and delineation wells is based on USGS estimates developed for an average well depth of 4878 meters (16,000 ft). These volumes are summarized on table IV.A.1.a.-1. for the proposal (alternative I) as well as alternatives IV, V, and VI.

The amount of drilling muds discharged during the normal operation of a well depends mainly upon the type of formation drilled. The more active clays contained in some formations are the more difficult to remove from muds, thus requiring more mud disposal. The formation and conditions also dictate the mud densities required. This determines the cost and type of equipment needed in separation of mud compounds. Other considerations include the cost of the additives and disposal. Generally, the more difficult it is to separate solids from the mud compound, the greater the need for discharge. Conversely, the more costly the additives or disposal, the lesser the discharge. The USGS estimates that the overboard loss of mud (discharge) would be small; downhole mud loss would be 10 percent of the used mud. Mud discharge on production wells would be recycled and reused.

Approval of mud disposal may or may not be site-specific, but may be applied to the entire drilling program. Drilling muds are normally discharged: 1) with the drill cuttings; 2) when cleaning shale or sand tanks; 3) while drilling the upper portion of the hole before establishing circulation to the drilling platform; and 4) upon disconnection of a marine riser. The last two cases apply only to operations from floating drill platforms and not to jack-ups or fixed production platforms.

Chromium, present in some marine drilling muds, is of concern because of its possible toxic effects on marine organisms. Overboard loss or discharge of drilling fluids would introduce some of this chromium into the marine environment. Chromium occurs in the form of an organic complex ferrochrome lignosulfonate, which may be used in mud programs on the Alaska OCS. Most oil-based muds are used to prevent blowouts and to contain cases during well completion.

The use of chrome materials, oil, and other toxics in some Pacific offshore mud systems has been avoided for several years. Sodium lignosulfonate has replaced ferrochrome lignosulfonate in some Pacific offshore mud systems.

Barium sulfate is essentially non-toxic to marine organisms. It is used as a weighting agent to control formation pressures while drilling in the middle to bottom portions of the hole. Chromium lignosulfonates are thinners that are placed into a mud system for control of viscosity, gel strength, and filtrate loss. There is concern about products containing barium and chromium because of the possibility that certain toxics could be released into the environment.

Occasionally, abnormal formation pressures, exceptionally tight formations, or other problems require the use of oil-based mud or highly treated drilling muds. Drill cuttings are then separated and cleaned of entrained oil before being discharged overboard. The drilling muds are retained and shipped to shore and stored in tanks for future use.

Solvents which are used primarily to clean equipment on mobile rigs and platforms pose no significant threat to the OCS environment. Solvent that is spilled on the platform is collected by curbs, gutters, drains, or drip pans. The drainage is then treated in a gravity separator or transferred to the production treatment system. Discharge must meet EPA oil and grease limitations. Sewage treatment and disposal on offshore rigs and platforms is very similar to a holding and settling tank, but with the addition of a chlorination system. In this case, the system is normally a fiberglass container somewhere on the platform into which all toilet, kitchen, and laundry drains discharge. The usual settling and bacterial digestion takes place in the tank and the final effluent is chlorinated.

EPA regulations and OCS Orders require that the effluent have a minimum chloride residual of 1.0 mg/1 after a minimum retention time of 15 minutes. As in every other instance in which chlorination is used as a method of disinfection, the potential exists for the generation of trace quantities of chlorinated compounds that may be harmful organisms. However, the effects of such trace quantities are only now beginning to be investigated.

Since all sites occupied by drilling rigs must be avoided by fishing boats, this could result in the removal of some fishing grounds during the exploratory phase. Jack-ups remove some 1 to 2 hectares (2-5 acres) per structure, while semisubmersibles using 458 meters (1500 ft) anchoring radii would remove up to 65 hectares (162 acres) each. Permit applications for drilling normally request a 1-mile avoidance area. If such an avoidance buffer is included around each drilling rig, then 804 hectares (2,011 acres) per rig would be temporarily withdrawn from use. During the exploratory phase, 2412 hectares (6,033 acres) could be removed from fishing at any one time under the criteria of the proposed action. In the cases of alternatives IV, V, and VI, 1608 hectares (4,022 acres) would be removed from fishing activities. Under the criteria of the maximum scenario some 3216 hectares (8,044 acres) would be removed during the year of peak exploratory activity (1984).

It has been assumed that Kenai, primarily, and Homer, secondarily, would function as marine support bases for sale 60 exploratory activities. In the mean case, six service vessels would operate from these support facilities. Up to ten service vessels would be required in the maximum case.

Air support activities would come most probably from fields located near the sale 60 marine support bases. The exploratory phase of the mean case would require up to four helicopters, while that of the maximum case would require up to six helicopters.

Peak employment during the 5-year exploratory phase is estimated to occur in 1985 when 519 persons would be employed. For a detailed description of the basic assumptions used to estimate employment, and summary tables of direct employment, refer to appendix B.

b. Activities Associated with Development: If oil and gas are discovered as a result of this proposed sale, fixed platforms may be installed offshore. Technology presently exists to install platforms in all water depths which would be encountered as a result of this proposed sale.

It is assumed that all production platforms would be constructed outside of Alaska; either at existing U.S. west coast or Japanese shipyards. The platforms would then be transported to location via barges.

Once platforms were installed, one or two drilling rigs would be placed on each platform to drill production wells. For purposes of this analysis, it is estimated that as a result of this proposal there may be 195 development wells drilled from 4 platforms. The maximum case would involve the drilling of 295 production wells from 6 platforms. Since all sites occupied by production platforms must be avoided by fishing boats, this could result in the removal of some fishing grounds. Each platform occupies a site of 1 to 2 hectares (2-5 acres). Assuming a 1-mile buffer zone around each, 3216 hectares (8,044 acres) might become off limits for fishing because of platforms installed as a result of the proposal. The sites would be usable again once platforms were removed after the termination of production.

During the development stage, drilling muds are recycled from one well to another (the downhole loss being about 10%). The amount of mud used for each initial 10,000-foot platform production is estimated to be some 750 tons. The volume of drill cuttings for the field has been estimated at 40170 cubic meters (52,455 yd^3) assuming the proposal, and 60770 cubic meters (79,355 yd^3) for the maximum case.

The development period of sale 60 is expected to occur between 1986 and 1991. (Please note that there is no clean time distinction between the exploratory, development, and production periods. In reality the wind-down phase of one activity or period would extend into the time frame of another.) It is during this period that drilling and construction activities would reach their greatest intensity. In this 5-year timeframe: exploratory drilling would be terminated (1987), the bulk of developmental drilling would occur, all trunk pipelines would be emplaced, the oil terminals and gas compressor station, as well as all necessary industrial infrastructures would be constructed.

Existing support and supply facilties at Kenai would likely be sufficient to handle any sale 60 activity emanating from that port. However, by 1986 a second 10-hectare (25 acres) marine support base could be constructed at Homer. In the same year two oil terminals and a gas compressor station would be built. The oil terminals would require 120 acres apiece and the gas compressor station about 40 acres. The compressor station and one oil terminal

could be located at a point somewhere between Anchor Point and Stariski Creek. The other terminal could be located north of Port Lions in the Talnik Point/ Inner Point area. Both terminals would have the capacity to store up to five days production. Additionally, the airfield at Port Lions would undergo construction activities aimed at improving its effectiveness in supporting developmental efforts.

By 1987 a total of 380 miles of 18-inch gas and 24-inch oil trunk pipeline may be operating (please review table IV.A.1.b.-1 for a breakdown of onshore and offshore pipeline lengths). The oil pipeline would consist of two systems, one of which would drain the production of the Cook Inlet into the Anchor point facility. The other pipeline would drain the oil production of the Shelikof Strait into the Talnik Point facility. All gas would be piped to the compressor station and, hence, overland 113 kilometers (70 mi) to the existing LNG plant(s) at Nikiski. The pipeline route to Nikiski would traverse a flat, wooded coastal plain dissected by occasional creeks and rivers. By 1991, with the drilling of the last of the production and service wells, the developmental stage would end.

In comparing the development phase of the proposal with those of the alternatives, it is apparent that the scenarios for the alternatives are, for the most part, variations on the scenario established for the proposal. Alternatives IV and V are essentially the Cook Inlet portions of the proposal's scenario. Alternative VI is essentially the southern half of the proposal but differs from it in that extracted gas would be reinjected into the formation. The maximum case scenario (see appendix A) is exactly that of the proposed action.

Peak employment for the development phase is hypothesized to occur in 1986 with a total annual employment of 1,607. This would include 430 persons involved in offshore drilling, 325 persons for service vessels and helicopter support, and 852 workers necessary for the onshore facility construction. For a detailed description of the basic assumptions used to estimate employment and summary tables of direct employment refer to appendix B. For supply vessel and aircraft requirements refer to appendix A.

c. Activities Associated with Production: During peak production, offshore employment supporting oil and gas operations would be less than during the development phase. Transportation requirements, and consequently onshore operating base employment, would also be reduced. At peak production, two helicopters and two supply vessels would be used. Annual employment during the peak production year (1991) would be 987 persons; 617 people would be involved in offshore drilling and onshore production activities, and 370 persons employed in the various transportation support systems.

For purposes of this analysis, it is assumed that 195 production/development wells would be drilled (mean case). Daily production of 265 Mbbls of oil and 464 bcf of natural gas could result from the amounts of recoverable resources estimated by the USGS. As previously indicated, production is expected to be conducted from four platforms. These production platforms would contain all the equipment and perform the same functions as an onshore field gathering station.

Table IV.A.1.b.-1
Summary of Pipeline Lengths and Sea Bottom Disturbances[1/]

	Minimum Case	Mean Case (Alt.I)	Maximum Case	Alt. IV	Alt. V	Alt. VI
Oil Pipeline Diameter	18"	24"	26"	18"	18"	18"
Gas Pipeline Diameter	10"	18"	26"	10"	10"	10"
Onshore (lengths)						
Oil Pipeline	-0-	14 km	14 km	-0-	-0-	-0-
Gas Pipeline	97 km	97 km	97 km	97 km	97 km	97 km
Offshore						
Oil Pipeline	110 km	221 km	221 km	124 km	110 km	110 km
Gas Pipeline	110 km	221 km	221 km	124 km	110 km	110 km
Total Sea Bottom Disturbance	441600 m^3	1104000 m^3	1324800 m^3	496800 m^3	441600 m^3	441600 m^3

[1/] It is assumed that the oil and gas pipeline will be laid in separate cut parallel trenches.

Source: USGS, 1980; and BLM Alaska OCS, 1980.

In regard to produced liquids, the amount of formation water produced as a result of the proposed action is difficult to estimate in light of the incomplete knowledge of the geology of Shelikof Strait. Using the upper Cook Inlet oilfield as a possible yardstick, it can be hypothesized that at mid-life (12 yrs), the sale 60 field might produce one barrel of formation water for every two barrels of oil.

The transportation of natural gas, produced as a result of sale 60, to Nikiski may necessitate the expansion of the then existing LNG facilities. Pacific Alaska LNG Associates are scheduled to begin construction of their 400 MMcf/day LNG plant in spring of 1982. The new Pacific plant coupled with the existing Phillips plant would bring the processing capacity of Nikiski to 585 MMcf/day of nautral gas. Pacific-Alaska LNG officials have discussed informally the possibility of adding an additional 200 MMcf/day capacity to their future Nikiski plant; however, such an eventuality (or even the planning for such an event) would depend entirely on the success of resource explorations in the Cook Inlet and on the Kenai Peninsula.

All LNG produced as a result of sale 60 would be transported to the west coast of the United States. The point of reception would likely be the proposed LNG degasification plant at Point Conception, California. However, should a major gas strike be realized within the sale 60 area, the Point Conception plant may not be able to handle the full amount of production. This possible west coast "glut" of natural gas may necessitate transportation schemes different from those outlined within this EIS.

A 25-year life for the production of oil and 26-year life for natural gas has been forecast for the proposal. Upon cessation of production, OCS orders require wells to be plugged, the casing severed well below the mudline, the platform removed, and all obstructions cleared from the area. Major trunklines may be used for future production from adjacent areas, but smaller lines would probably be abandoned in place. Abandonment consists of purging the lines of entrained hydrocarbons by water flushing (the water is disposed of onshore after reclaiming the hydrocarbons) and severing the ends below the mudline. Water from the flushing operation would be disposed of according to State and Federal regulations. The necessity for removal of pipelines nearshore is usually regulated by the State.

d. Oilspill Risk Analysis: Oilspills are one of the major concerns associated with offshore oil production. There is uncertainty about whether oil will be discovered, or the amount of oil which may be produced. In addition, uncertainty exists as to the number and size of oilspills which might occur, and the wind and current conditions which would transport the oil.

The oilspill risk analysis was conducted in three parts. The first part dealt with the probability of oilspill occurrence, and the second with the trajectories of oilspills from potential launch points to various targets. Results of these two parts of the analysis were then combined to give estimates of the overall or final oilspill risk associated with oil and gas production in the lease area.

Estimating Quantity of Oil Resources: The estimated oil resources used for oilspill risk calculations in this report are "unrisked mean estimates"--the

amount of oil expected to result from the proposed sale assuming that oil is discovered in economically recoverable quantities.

Where the likelihood of not finding oil is high--as is the case for proposed lease sale 60--the risked mean estimate will be much lower than the unrisked mean estimate. The unrisked mean estimate used in this analysis, therefore represents a worst case in terms of potential oilspills. For the entire proposed lease area, the unrisked mean estimate over the 26-year life of the field is 670 MMbbls. For alternative IV, the unrisked mean estimate was calculated to be 270 MMbbls; for alternative V, 208 million barrels; and alternative VI, 335 MMbbls. The estimates for the alternatives could differ by about 10 percent, depending upon assumptions made in estimating the amount of oil in each subarea. The unrisked mean estimate of resources from existing leases in lower Cook Inlet is 826 MMbbls (sec. II.B.1.a.). Again, it is very unlikely that all of these oil resources would be discovered. However, over the 26-year life of the proposed sale 60 leases, an estimated 1,050 MMbbls of oil from other sources will be transported by tankers through the study area.

Probability of Oilspills Occurring: Statistical distributions for estimating probabilities of oilspill occurrence were taken from Devanney and Stewart (1974), Stewart (1975), and from USGS files of offshore platform accidents. Greater risks are associated with greater volumes of oil. In this analysis, it was assumed that 1) future spill frequencies can be predicted from past OCS experience, 2) spills occur independently of each other, and 3) the spill rate is dependent on volume of oil produced and handled. The first assumption might be modified by a decrease in future spill rates due to experience and improved standards, or by an increase because of unknown conditions in new territory. The assumption that spills occur independently of each other could be modified by assuming a positive correlation (if a spill occurs, conditions are such that more will follow shortly) or by assuming a negative correlation (if a spill occurs, extra precautions are taken). This analysis takes the middle ground between these two assumptions by using the historic spill rates. The final assumption--that the spill rate is a function of the volume of oil handled--might be modified on the basis of size, extent, frequency, or duration of the handling. In the case of tanker transport, for example, the number of port calls and the number of tanker-years have been contemplated (Stewart, 1976 and Stewart and Kennedy, 1978). This analysis uses volume of oil handled, since all other estimates must ultimately be derived from this quantity.

Spill frequency estimates for oilspills greater than 1,000 barrels in size were calculated for production and transportation of oil from proposed sale 60, from sale CI, and for existing transportation of oil by tankers from upper Cook Inlet. For lease sale 60, an average of four spills greater than 1,000 barrels are projected over the 26-year life of the field. There is a 98 percent chance that at least one spill of this magnitude will occur. Table 1, appendix D shows the expected number of spills and the most likely number of spills that could occur during the production life of the lease area.

Oilspill Trajectory Simulations: To model oilspill movement in the complex wind and current regime of the study area, two trajectory models were mathematically linked. The first was a model developed for the Cook Inlet and Shelikof Strait areas by Dames and Moore, Inc., under the BLM Environmental Studies Program. This model incorporates tidal currents and the effects of

nearby mountains on winds, two effects which significantly influence oilspill movement in both Cook Inlet and Shelikof Strait. For any spill originating within either area, the wind record was sampled by randomly selecting a starting time and date, and the tidal currents were calculated to match the wind record. The movement of each trajectory was simulated in 30-minute increments, updating the winds and currents for each movement. The spill trajectories were transmitted to the U.S. Geological Survey, Reston, Virginia, via computer tapes.

The second trajectory model was the U.S. Geological Survey Oilspill Trajectory Analysis (OSTA) model, which was used to simulate the movement of any oilspills moving outside the boundaries of the Dames and Moore, Inc. model. This was essentially the same model used by Samuels and others (1980) for an earlier oilspill risk analysis of the now cancelled western Gulf of Alaska lease sale 46.

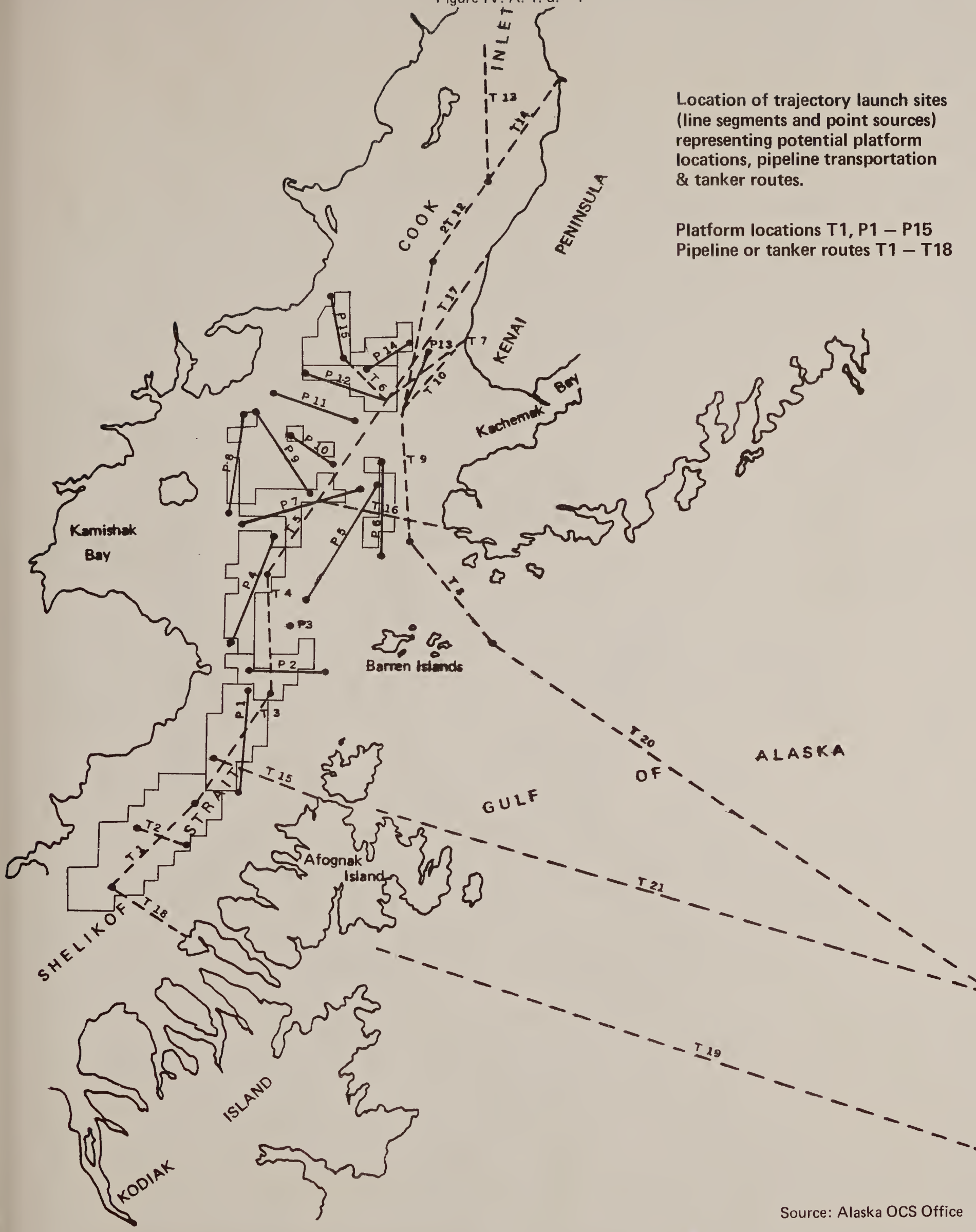
It should be emphasized that the trajectories simulated by the models represent only hypothetical pathways of oil slicks and do not involve any direct consideration of cleanup, dispersion, or weathering processes which would determine the quantity or quality of oil that could eventually come in contact with targets. Results of spill trajectories are presented for 3 days, 10 days, and 30 days. Three days represent relatively high toxicity potential with minimal weathering and dispersion. Within 10 days, most of the trajectories have made contact with land and resource targets within the proposed lease area, and for this reason may represent a worst case. Within 30 days, considerable weathering would be expected and most spills are difficult to track or locate after this time if they have not come in contact with land.

A total of 38 hypothetical point source and line spill locations were selected as likely spill locations from potential transportation routes and drilling sites within the study area (fig. IV.A.1.d.-1). In order to obtain a statistically significant sample, 200 trajectories were initiated at each launch site for both summer and winter seasons for a total of 15,200 trajectories. The summer season was defined as the period from April through September.

The major overall seasonal effect in the trajectories was a northward shift of the paths and impact locations during the summer season due to the decreased net transport and increased frequency of winds from the south during the summer. Sample trajectories launched from line segment P7 and point source P3 showed a net movement into Shelikof Strait during the winter period (figs. IV.A.1.d.-2 and IV.A.1.d.-3). Some of the trajectories from the more northern source, P7, moved into Kamishak Bay and also through Stevenson Entrance to the west in the winter (fig. IV.A.1.d.-2). Trajectories launched further south at P3 behaved similarly, but did not enter Kamishak Bay during the winter. During summer, at both sample launch points, the trajectories from P7 were more variable, but predominantly dispersed northward where the patterns suggest an expected greater influence from tidal flux (figs. IV.A.1.d.-4 and IV.A.1.d.-5).

The sample trajectories from P3 during the summer season were also highly variable and remained somewhat confined within the area of P3. Those trajectories which entered the Shelikof Strait made contact with land segments along the east bank (fig. IV.A.1.d.-5). For additional impacts with respect to seasonal effects, see the respective impact section for the biological resources.

Figure IV. A. 1. d. –1

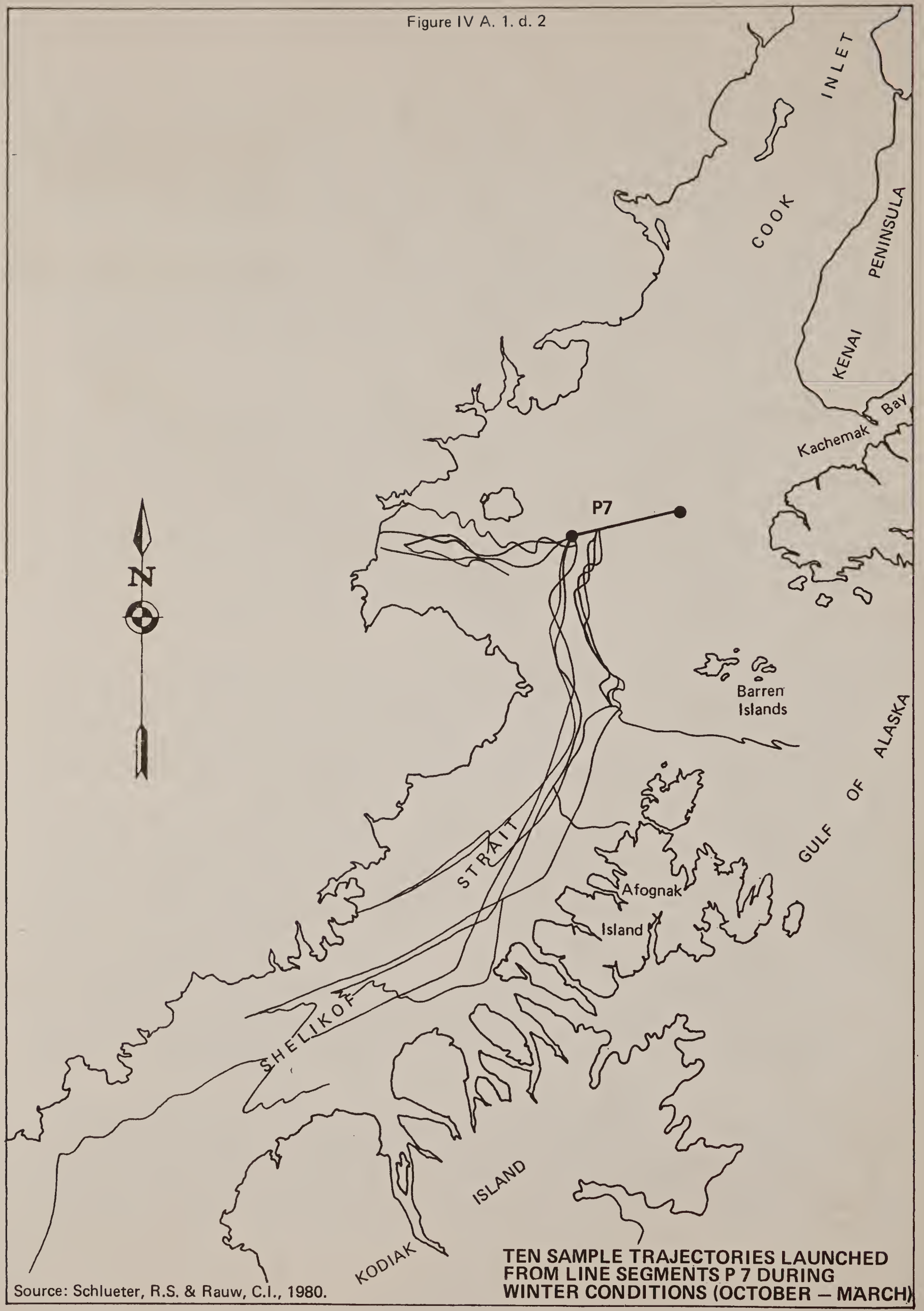


Location of trajectory launch sites (line segments and point sources) representing potential platform locations, pipeline transportation & tanker routes.

Platform locations T1, P1 – P15
Pipeline or tanker routes T1 – T18

Source: Alaska OCS Office

Figure IV A. 1. d. 2



TEN SAMPLE TRAJECTORIES LAUNCHED FROM LINE SEGMENTS P 7 DURING WINTER CONDITIONS (OCTOBER – MARCH)

Source: Schlueter, R.S. & Rauw, C.I., 1980.

Figure IV A. 1. d. 3

TEN SAMPLE TRAJECTORIES LAUNCHED FROM POINT SOURCE P 3 DURING WINTER CONDITIONS (OCTOBER – MARCH)

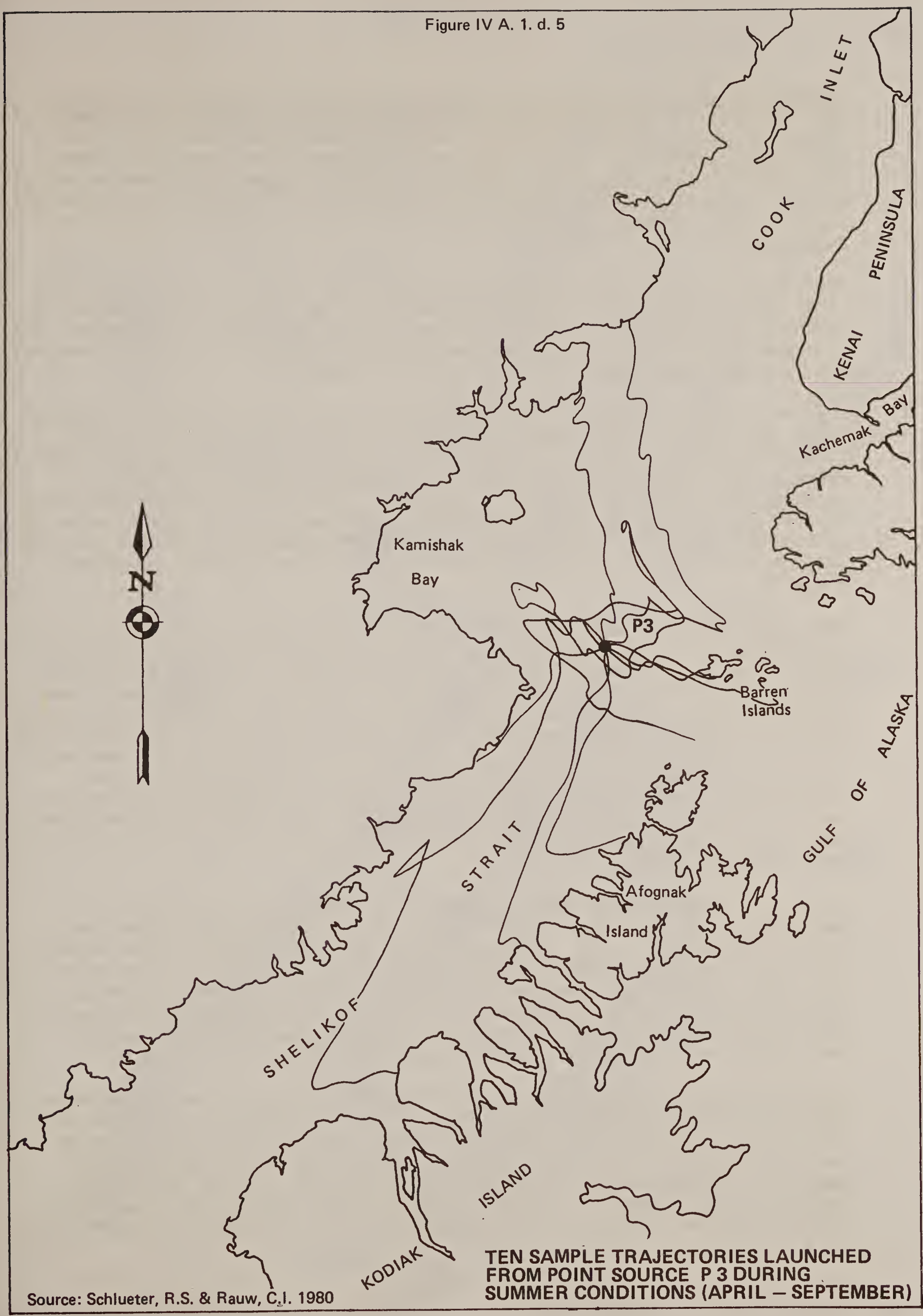
Source: Schlueter, R. S. & Rauw, C.I., 1980

Figure IV. A. 1. d. 4

TEN SAMPLE TRAJECTORIES LAUNCHED FROM LINE SEGMENT P 7 DURING SUMMER CONDITIONS (APRIL – SEPTEMBER)

Source: Schlueter, R.S. & Rauw, C.I. 1980

Figure IV A. 1. d. 5



TEN SAMPLE TRAJECTORIES LAUNCHED FROM POINT SOURCE P 3 DURING SUMMER CONDITIONS (APRIL – SEPTEMBER)

Source: Schlueter, R.S. & Rauw, C.I. 1980

Combined Analysis of Oilspill Occurrence and Oilspill Trajectory Simulations: Data in table 1, appendix D indicate the probabilities of different numbers of oilspills greater than 1,000 barrels occurring during the production life of the field. Tables 2 through 7 (appendix D) indicate the conditional probabilities that targets or land segments will be contacted, given that an oilspill occurs. Combining these two sets of probabilities yields the final probabilities (tables 8-31, appendix D) that oilspills will occur and contact targets or land segments.

Conditional probabilities depend only on the winds and currents of the study area--elements over which the decisionmaker has no control. Final probabilities on the other hand, will depend not only on the physical conditions, but also the expected recoverable oil resource as determined by the decisionmaker, e.g. choosing the proposal or one of the alternatives.

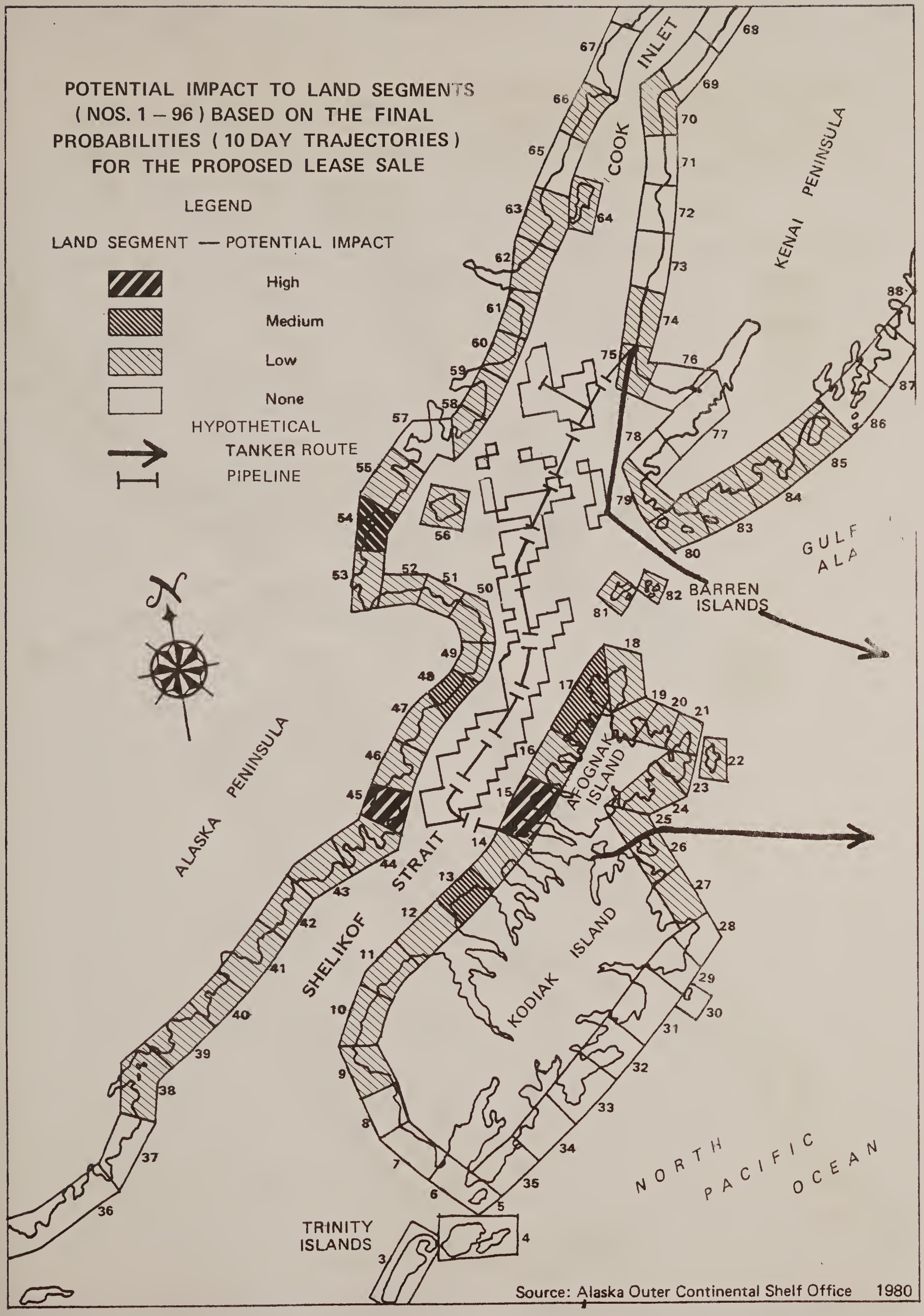
A relative scale using the final probabilities was used to identify levels of potential impact. Land segments which had a greater than 20 percent final probability of contact by an oilspill were classified as high potential impact areas. Land segments which had an 11 to 20 percent final probability of contact were designated as moderate potential impact areas. Those areas with less than an 11 percent final probability of contact were designated areas of low impact potential. These impact ranges were somewhat arbitrarily selected to provide a reasonable basis upon which impacts from oilspills could be analyzed.

When compared to the proposal (fig. A.1.d.-6), alternatives IV (fig. A.1.d.-7) and V (fig. A.1.d.-8) significantly reduce the potential impact to land segments primarily in Shelikof Strait. For the proposal, there is a 77 percent chance of an oilspill contacting land within 3 days, and a 94 percent chance within 10 days. For alternative IV there is a 38 percent chance of an oilspill contacting land in 3 days and a 69 percent chance in 10 days. For alternative V there is a 32 percent chance of an oilspill contacting land in 3 days and a 59 percent chance in 10 days (table IV.A.1.d.-1). In general, for 3-day trajectories, alternatives IV and V reduce the potential impacts of the proposal by 39 percent and 45 percent respectively. For a more complete assessment of the type of impacts associated with these land segments, see sections IV.A.2 through IV.A.7.

Potential oilspills from alternative VI (Shelikof Strait) represent, for the most part, a low potential impact for the east and west banks of Shelikof Strait (fig. IV.A.1.d.-9). The west bank of Shelikof Strait at land segment 45, which extends from Kukak Bay to Kinak Bay, has a relatively high potential for impact. On the east bank of Shelikof Strait, land segment 15, which extends from Malina Bay to Kupreanof Strait, has a moderate impact potential. With the 3-day trajectories there is a 75 percent chance of oil reaching shore, most of which would be in Shelikof Strait (table IV.A.1.d.-1).

Cumulative Potential Impacts: Cumulative potential impacts were considered with the estimated resource development of the existing leases (CI) and with the existing tankering from upper Cook Inlet. Based on the above relative scale of potential impact, the existing leases alone yield high potential impact for Kamishak Bay and moderate potential impact for the following: Shelikof Strait (segments 17 and 45), Anchor Point (segment 75), the Barren Islands (segment 81) and in and around Chinitna Bay (segments 58 and 59) (fig. IV.A.1.d.-9).

FIGURE IV. A. 1. d. – 6



Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.– 7

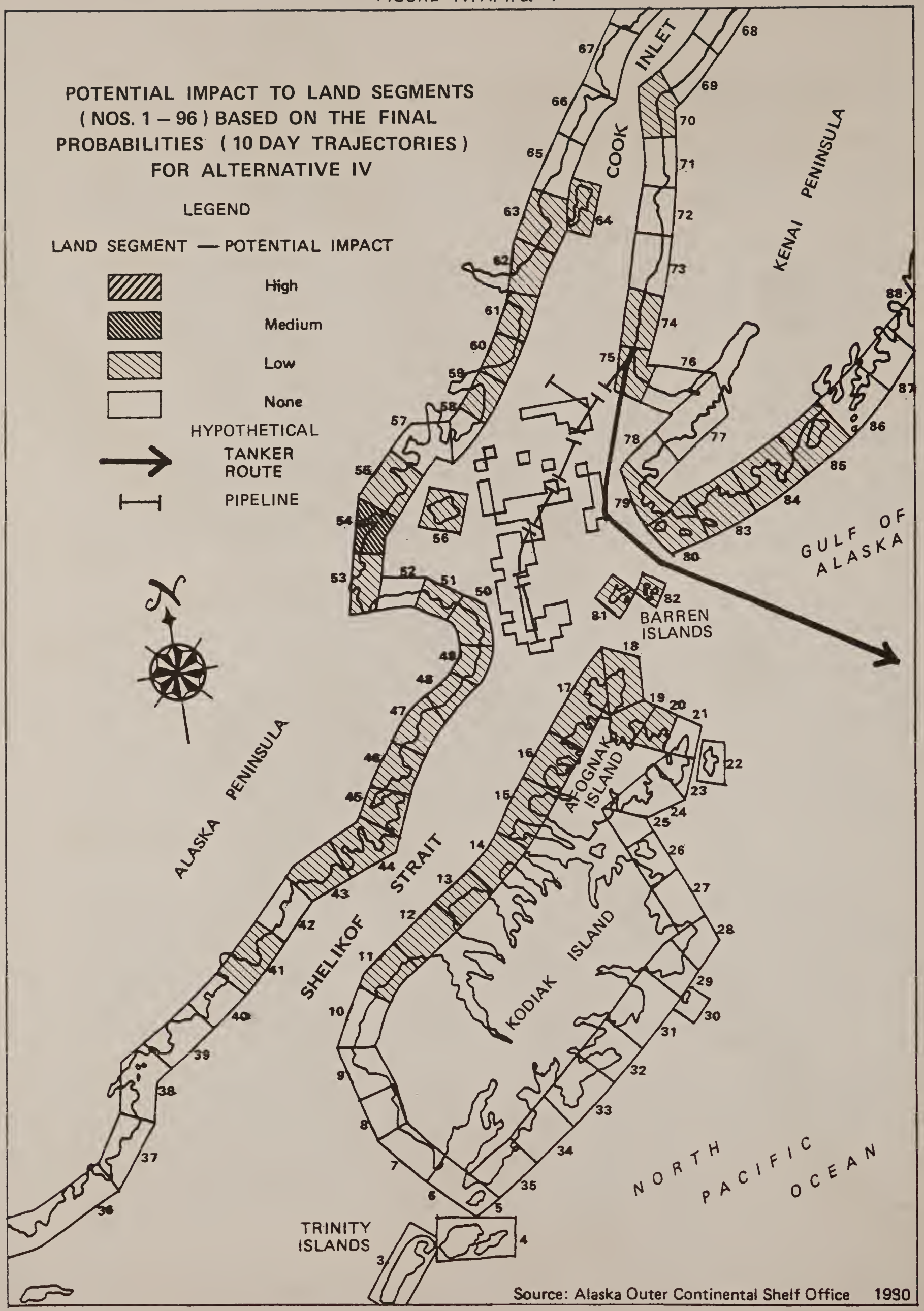
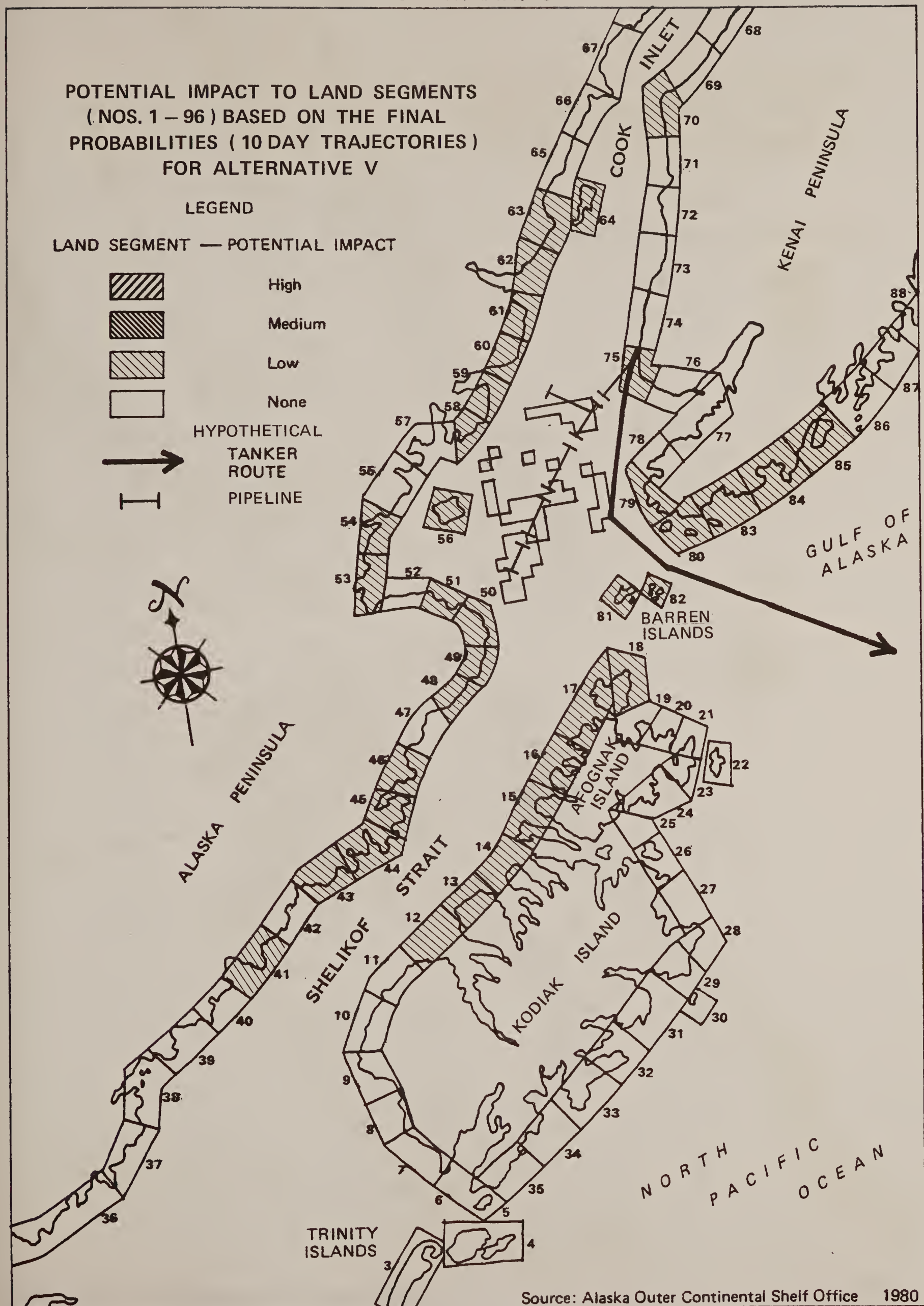
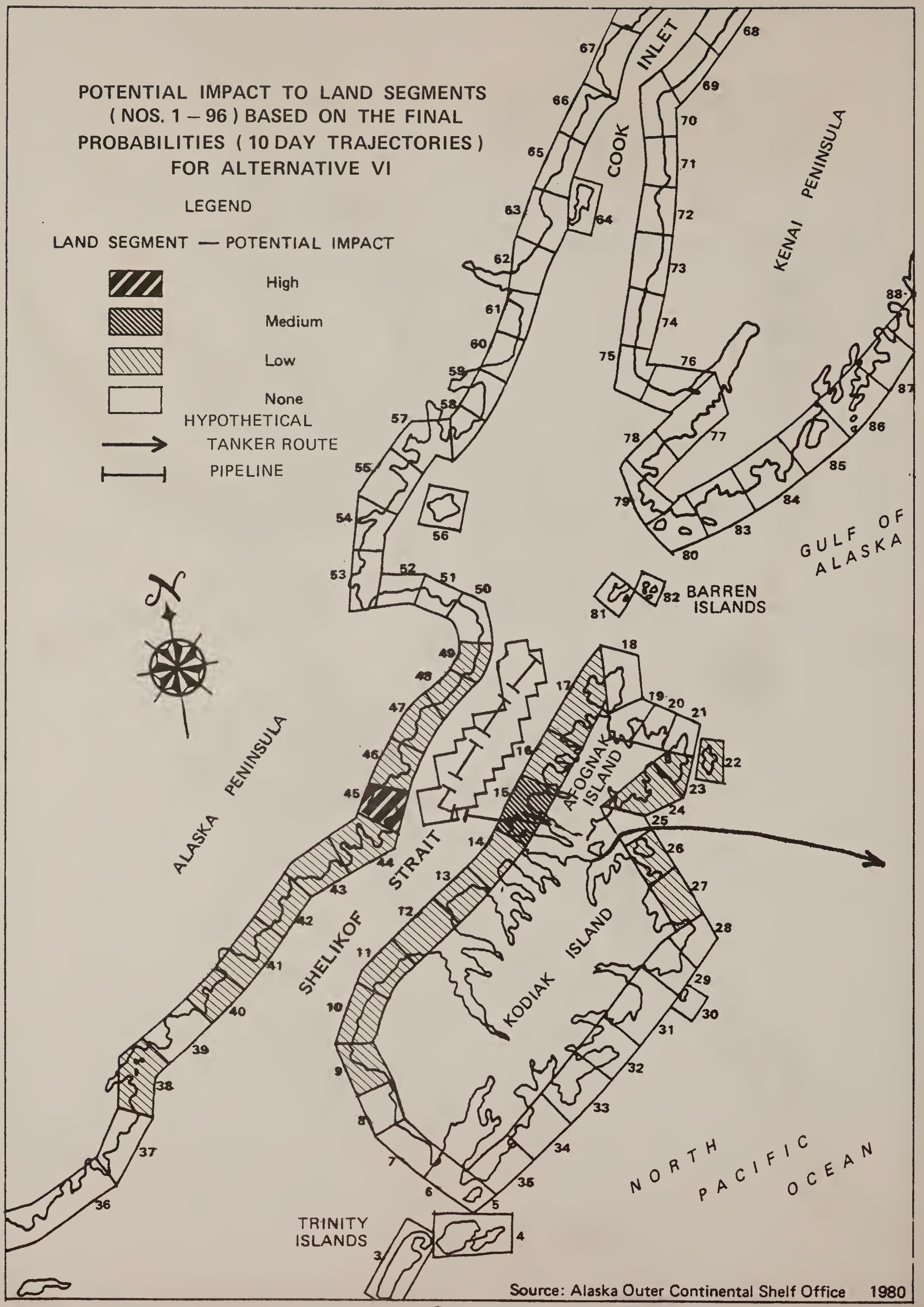


FIGURE IV. A. 1. d.– 8



Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.– 9



Source: Alaska Outer Continental Shelf Office 1980

Table IV.A.1.d.-1
Final Probabilities (percent chance) of an Oilspill
Contacting Land Within 3 Days, 10 Days, and 30 Days
Over the Production Life of the Proposed Lease Area

	3 Days		10 Days		30 Days	
	Proposed	Cumulative*	Proposed	Cumulative*	Proposed	Cumulative*
Proposal	77	95	94	99	96	99
Alternative IV	38	85	69	99	74	99
Alternative IV	32	83	59	99	65	99
Alternative VI	59	95	75	100	80	100
Transportation						
Alternative A	72	93	95	99	97	99
Alternative B	72	93	94	99	96	99
Alternative C	78	95	93	99	96	99

* Cumulative includes existing leases in Cook Inlet, proposed leases, and existing tanking from upper Cook Inlet.

FIGURE IV. A. 1. d.– 10

POTENTIAL IMPACT TO LAND SEGMENTS (NOS. 1 – 96) BASED ON THE FINAL PROBABILITIES (10 DAY TRAJECTORIES) FOR THE EXISTING LEASES

LEGEND

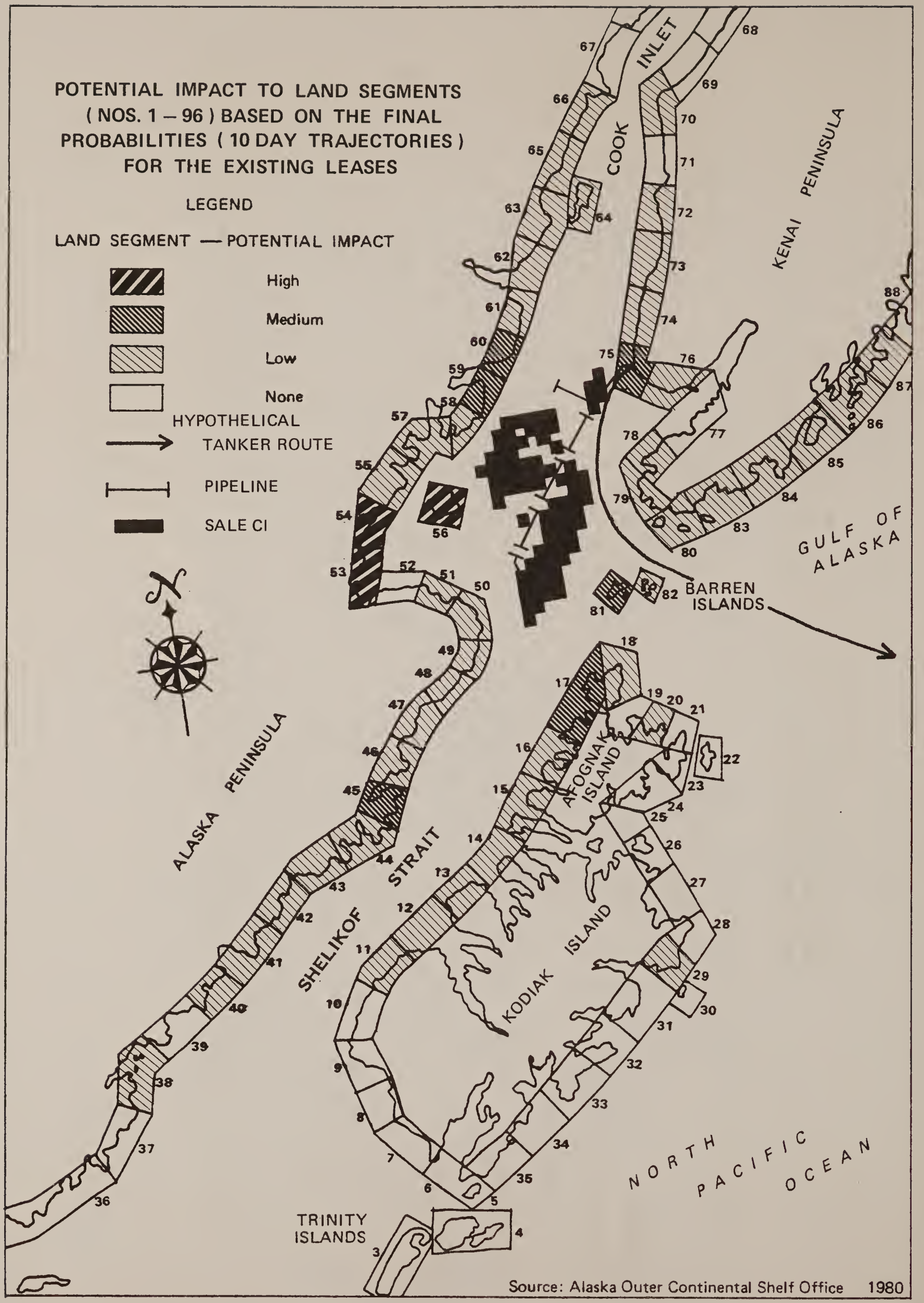
LAND SEGMENT — POTENTIAL IMPACT

- High
- Medium
- Low
- None

HYPOTHELICAL TANKER ROUTE

PIPELINE

SALE CI



Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.– 11

POTENTIAL CUMULATIVE IMPACT TO LAND SEGMENTS (NOS. 1 – 96) BASED ON THE FINAL PROBABILITIES (10 DAY TRAJECTORIES) FOR THE PROPOSED LEASE SALE AND THE EXISTING LEASES

LEGEND

LAND SEGMENT — POTENTIAL IMPACT

- High
- Medium
- Low
- None

HYPOTHETICAL TANKER ROUTE

PIPELINE

SALE CI

COOK INLET

KENAI PENINSULA

GULF OF ALASKA

BARREN ISLANDS

ALASKA PENINSULA

SHELIKOF STRAIT

AFOGNAK ISLAND

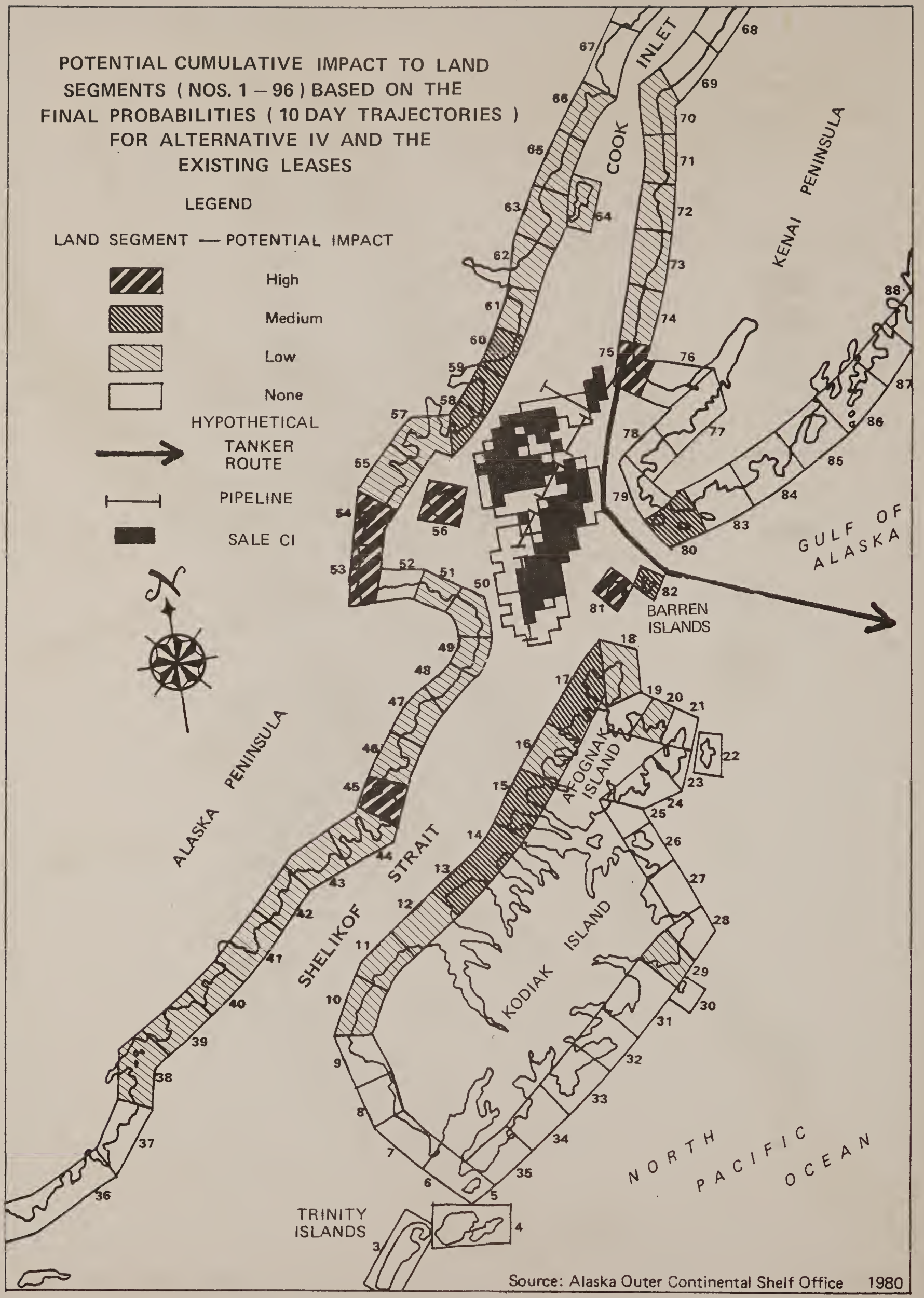
KODIAK ISLAND

NORTH PACIFIC OCEAN

TRINITY ISLANDS

Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.–12



Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.– 13

POTENTIAL CUMULATIVE IMPACT TO LAND SEGMENTS (NOS. 1 – 96) BASED ON FINAL PROBABILITIES (10 DAY TRAJECTORIES) FOR ALTERNATIVE V AND THE EXISTING LEASES

LEGEND

LAND SEGMENT — POTENTIAL IMPACT

High

Medium

Low

None

HYPOTHETICAL TANKER ROUTE

PIPELINE

SALE CI

COOK INLET

KENAI PENINSULA

GULF OF ALASKA

BARREN ISLANDS

AFOGNAK ISLAND

KODIAK ISLAND

SHELIKOF STRAIT

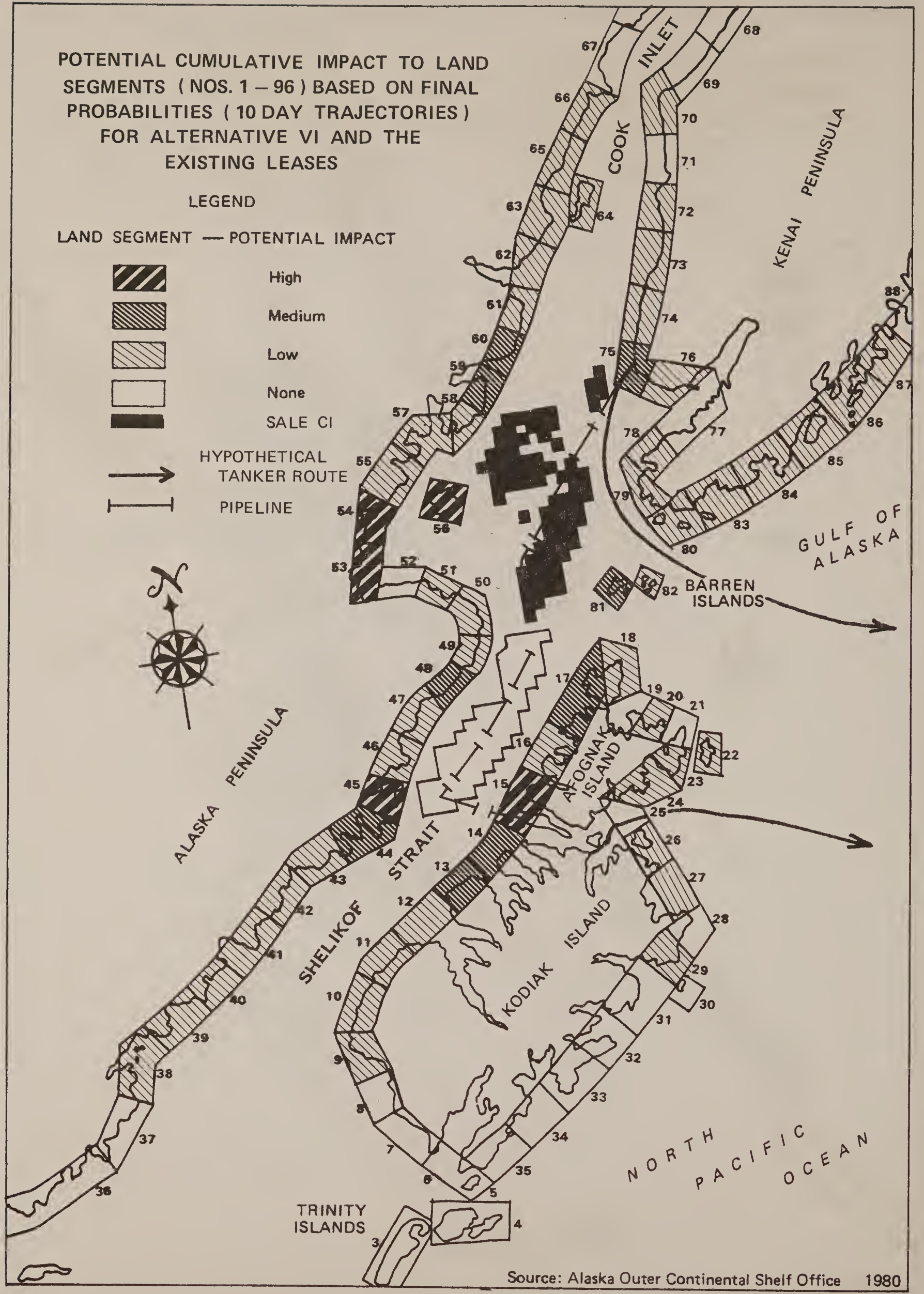
ALASKA PENINSULA

TRINITY ISLANDS

NORTH PACIFIC OCEAN

Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.– 14



Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.– 15

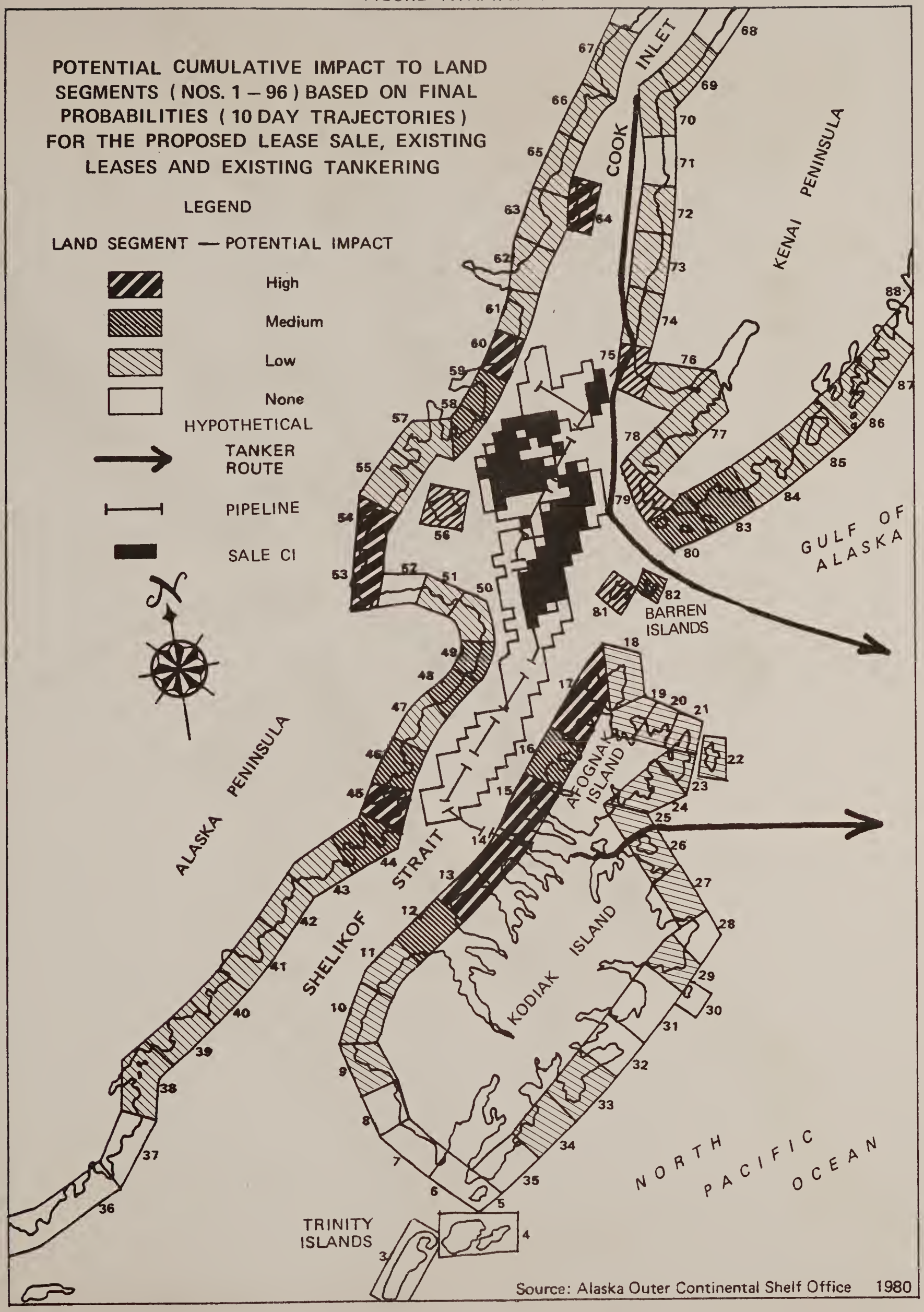
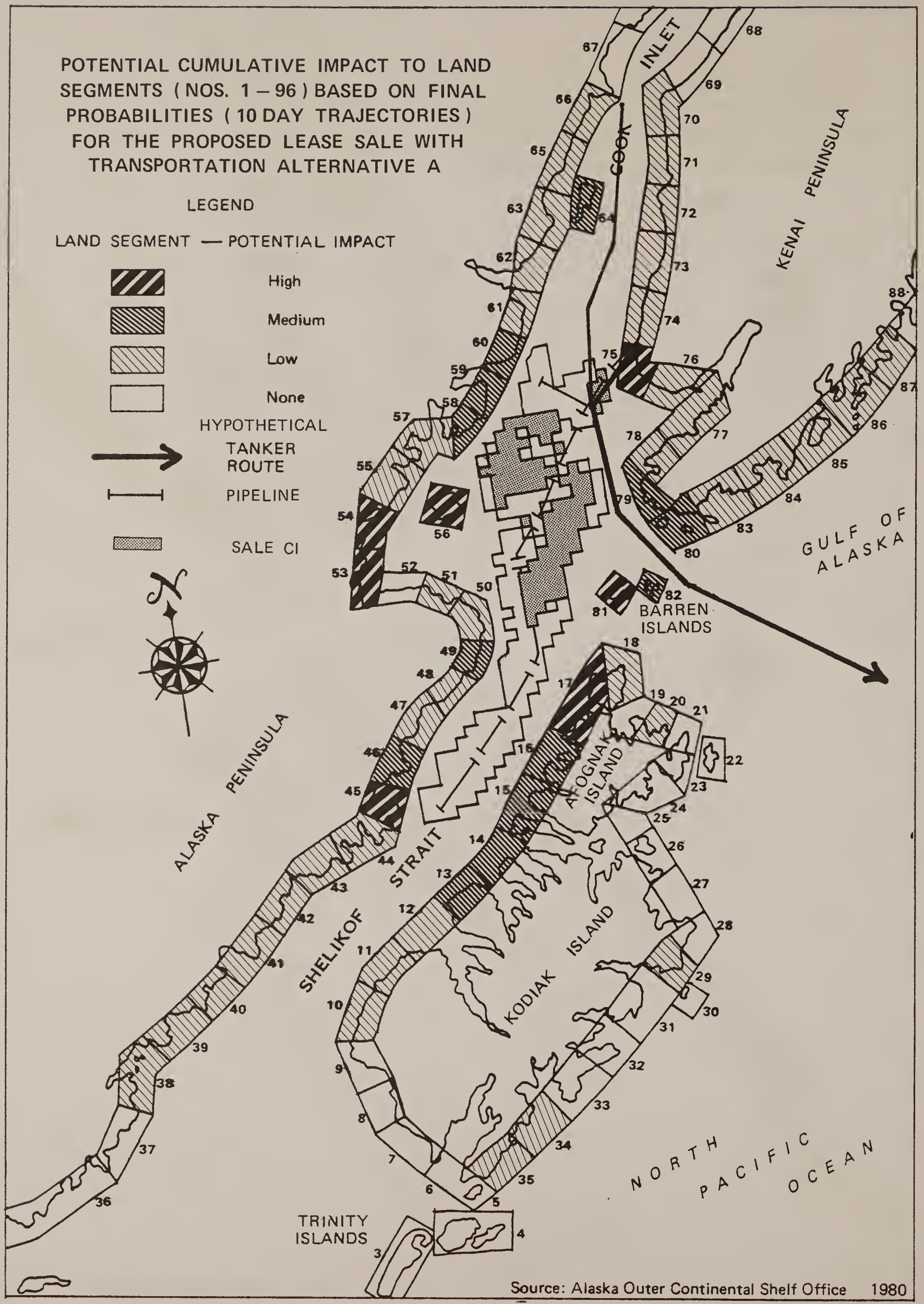


FIGURE IV. A. 1. d.– 16



Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.– 17

POTENTIAL CUMULATIVE IMPACT TO LAND SEGMENTS (NOS. 1 – 96) BASED ON FINAL PROBABILITIES (10 DAY TRAJECTORIES) FOR THE PROPOSED LEASE SALE WITH TRANSPORTATION ALTERNATIVE B

LEGEND

LAND SEGMENT — POTENTIAL IMPACT

- High
- Medium
- Low
- None

HYPOTHETICAL

- TANKER ROUTE
- PIPELINE
- SALE CI

COOK INLET

KENAI PENINSULA

GULF OF ALASKA

BARREN ISLANDS

AFOGNAK ISLAND

KODIAK ISLAND

SHELIKOF STRAIT

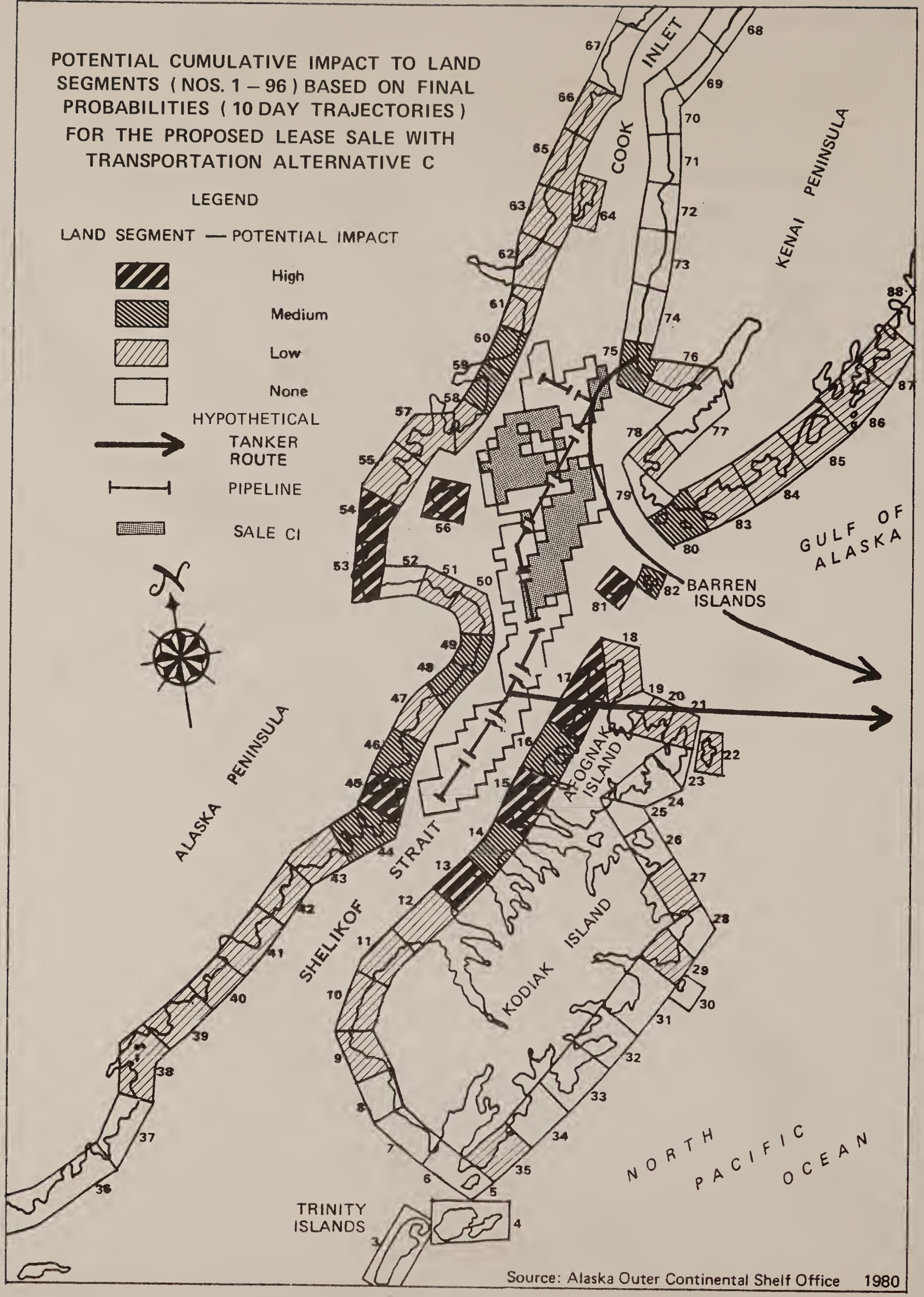
ALASKA PENINSULA

TRINITY ISLANDS

NORTH PACIFIC OCEAN

Source: Alaska Outer Continental Shelf Office 1980

FIGURE IV. A. 1. d.– 18



Source: Alaska Outer Continental Shelf Office 1980

The proposal plus the existing Cook Inlet leases produce 9 high and 11 moderately impacted land segments from the 10 day trajectories (fig. IV.A.1.d.-10). Alternative IV yields 6 high and 9 moderately impacted land segments (fig. IV.A.1.d.-11). Alternative V produces 5 high and 7 moderate impact areas (fig. IV.A.1.d.-12).

When considering the cumulative effects of the proposal with the existing leases in Cook Inlet, there is a 95 percent chance of an oilspill contacting land in 3 days and a 99 percent chance in 10 days. The alternatives reduce the cumulative probabilities only about 11 percent for the 3-day trajectory and are not significantly different for the 10-day trajectory (table IV.A.1.d.-1).

The addition of data concerning existing tankering from upper Cook Inlet to the oilspill risk analysis significantly increases the risk of the proposal. Additional high impact areas are produced at Kalgin Island (segment 64), north of Chinitna Bay (segment 60), English Bay (segment 76) and Viekoda and Uganik Bays (segment 14, fig. IV.A.1.d.-13).

The potential of an oilspill from the existing leases and tankering in Cook Inlet with respect to alternative VI increases the potential impact to both the east and west banks of Shelikof Strait (fig. IV.A.1.d.-14). Based on 10-day trajectories, the west bank of Shelikof Strait (land segments 44-45) has a 42 percent chance of contact by an oilspill. When potential spills from existing leases and tankering are considered there is a 28 percent increase or 70 percent chance, of oil contacting the west bank. Along the east bank (land segments 12-18) there is a 33 percent chance of contact by an oilspill from the existing leases and tankering activity.

A treatment of transportation scenarios different from those of the proposal by the oilspill risk model demonstrated very little difference in the areas of potential impact or in the magnitude of impact with respect to land segments (table IV.A.1.d.-1). For the four transportation scenarios analyzed in this environmental statement, the probability of an oilspill contacting a land segment ranged from 72 to 78 percent in 3 days, and 93 to 95 percent in 10 days.

Cumulative effects with respect to the proposal (fig. IV.A.1.d.-15) produce similar levels of potential impact for each of the transportation scenarios (fig. IV.A.1.d.-16 through -18). Cumulative final probabilities for the four scenarios range from 93 to 97 percent for 3-day trajectories and 99 percent for 10- and 30-day trajectories (table IV.A.1.d.-1).

For an evaluation of the relative impacts and feasibility of the transportation scenarios, refer to section IV.A.2.m.

Proposal Modifications Based Upon Limited Oilspill Risk: The optimal leasing plan is to choose from the list of tracts those areas which will offer the maximum potential production without exceeding acceptable levels of environmental risk. To assist the decisionmakers in this endeavor, the oilspill risk analysis of the proposal can be modified using linear programming techniques (Smith, et al., 1979).

As previously shown, the major shoreline areas which received relatively high frequencies of simulated oilspill trajectories include the east bank of Shelikof

Strait (land segments 13-18), the west bank of Shelikof Strait (land segments 44-49), Kamishak Bay (land segments 53-56), the Anchor Point area (land segments 74-75), and the Barren Islands and vicinity (land segments 79-82). Based on the relative scale of potential risk discussed earlier in this section (10% low, 11-20% moderate, and 20% high potential impact), these major geographic areas are the most vulnerable with respect to oilspills hitting specific land segments within these areas. The land segments that are highest in potential risk to impact by an oilspill (using the 3-day trajectories) include the Kupreanof Strait area, with a probability of 17 percent (segment 15) on the east bank of Shelikof Strait, and the Viekoda and Uganik Bay areas, with a probability of 23 percent (segment 45) on the west bank of Shelikof Strait. When considering the potential impact of the proposal, Kamishak Bay, Anchor Point, and the Barren Islands are low risk areas, but become high risk areas when potential cumulative impacts are considered.

If it is hypothesized that the maximum acceptable risk to any of the land segments were not to exceed a low potential impact of 10 percent, the proposal could be modified to stay within this constraint. The resulting modified proposal could be expected to produce about 430 MMbbls of oil. All of the tracts included in the proposal could be leased except for 40 percent of the T1 area and 100 percent of the P1 area (fig. IV.A.1.d.-19). These deletions would reduce the potential risk to land segments 15 and 45. The tracts along the eastern and western boundaries of the proposed T1 area present the greatest risk to the proposal.

If the hypothesized acceptable environmental risk were increased to a uniform limit of 20 percent, which is the upper moderate level of potential impact, the proposal would be limited primarly by the vulnerability of Viekoda and Uganik Bays (segment 45). Modifying the proposal to keep within a 20 percent potential risk level would mean that approximately 610 MMbbls of oil would be produced over the life of the field. The entire proposed sale area could be leased except for 60 percent of area P1 (fig. IV.A.1.d.-20). Deletion of 60 percent of area P1 could keep the Viekoda and Uganik Bay areas (segment 45) within a moderate level of potential risk. When considering the current and circulation patterns in this area, the westernmost tracts of area P1 face the greatest risk of contact by an oilspill.

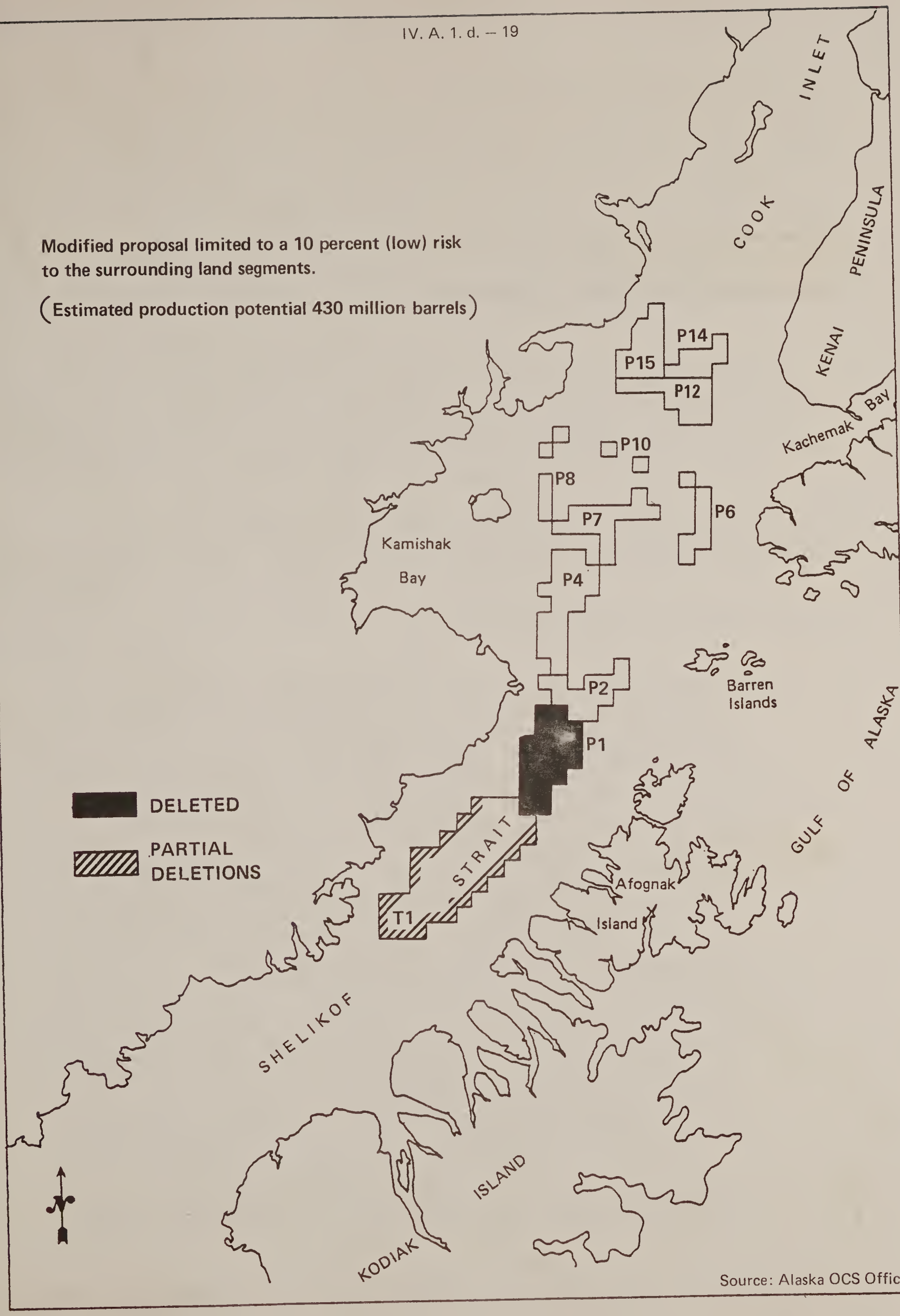
In both the 10 and 20 percent maximum potential risk cases the proposal is limited primarily by land segment 45. Additional considerations, such as the high biological resources within this area and the relatively high persistence potential of an oilspill, suggest a conservative 10 percent constraint as a more appropriate level of risk. However, should adequate contingency measures be developed for this area, the element of risk could be significantly reduced.

With respect to cumulative impacts, the present tankering activity from upper Cook Inlet and the expected production from lower Cook Inlet (OCS sale CI), many areas already face high potential risk from oilspills. These areas include Kamishak Bay (land segments 54 and 56) and Anchor Point (land segment 75). Assuming adequate cleanup and contingency measures are in place for these more vulnerable areas, the level of acceptable risk could be increased.

In this portion of the analysis, the limits to segments 45, 54, and 56 were increased to 25 percent. The high vulnerability of the Anchor Point area (segment 75), with respect to cumulative impact potential, was given a limit

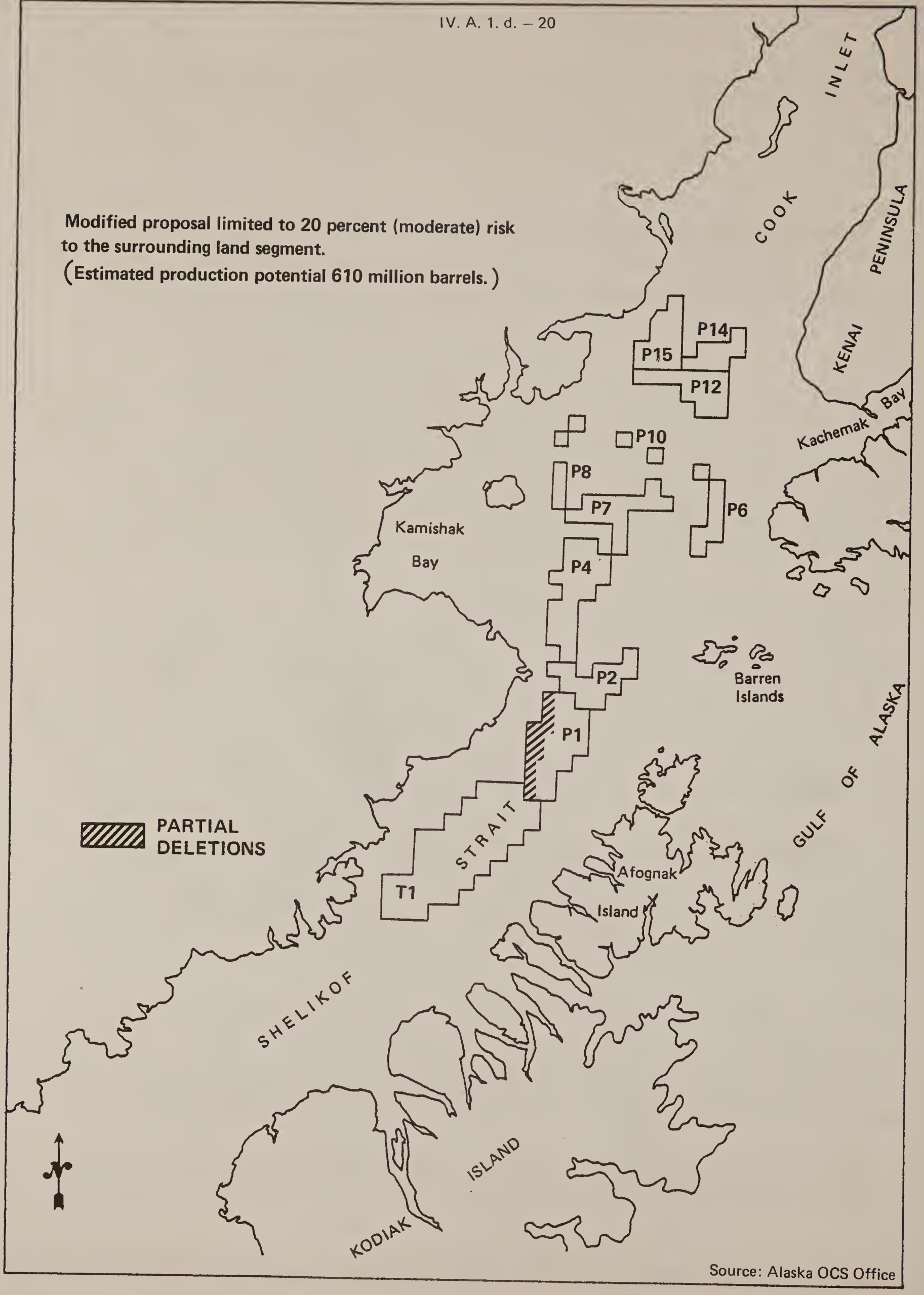
Modified proposal limited to a 10 percent (low) risk to the surrounding land segments.

(Estimated production potential 430 million barrels)



Source: Alaska OCS Office

Modified proposal limited to 20 percent (moderate) risk to the surrounding land segment.
(Estimated production potential 610 million barrels.)



Source: Alaska OCS Office

of 30 percent. Acceptable risk of all of the remaining land segments for the entire area was limited to a maximum potential risk of 10 percent. Under these constraints, the proposal could be modified to yield 530 million barrels of oil. The potential level of production would be achieved by leasing all of the tracts in sections P1, P2, P14; 80 percent of the tracts in sections T1 and P15; and 90 percent of the tracts in area P4 (fig. IV.A.1.d.1.-21). In this case, deletions are those that would reduce potential impact to the lower Cook Inlet. The tracts in P6, P7, P8, P10, and P12; 20 percent of those tracts in P15 and T1; and 10 percent of those tracts in P4 present the greatest risk. The impacts associated with this modification of the proposal are addressed primarily in the cumulative impact sections concerning alternative VI (sec. IV.A.7).

In conclusion, if the estimated oil resources from the existing leases in lower Cook Inlet are realized, the proposal could be modified as shown in figure IV.A.1.d.-21. In the absence of significant discoveries of oil from the existing leases and with adequate available contingency measures, the modified proposal as shown in figures IV.A.1.d.-19 and -20 would be most environmentally acceptable within the framework of this analysis.

e. Coastal Oilspill Persistence Index: This section describes the persistence of oilspills on coastlines. Coastlines essentially surround the proposed lease area, so are especially vulnerable to accidental oilspills, as described in the previous section (IV.A.1.d.).

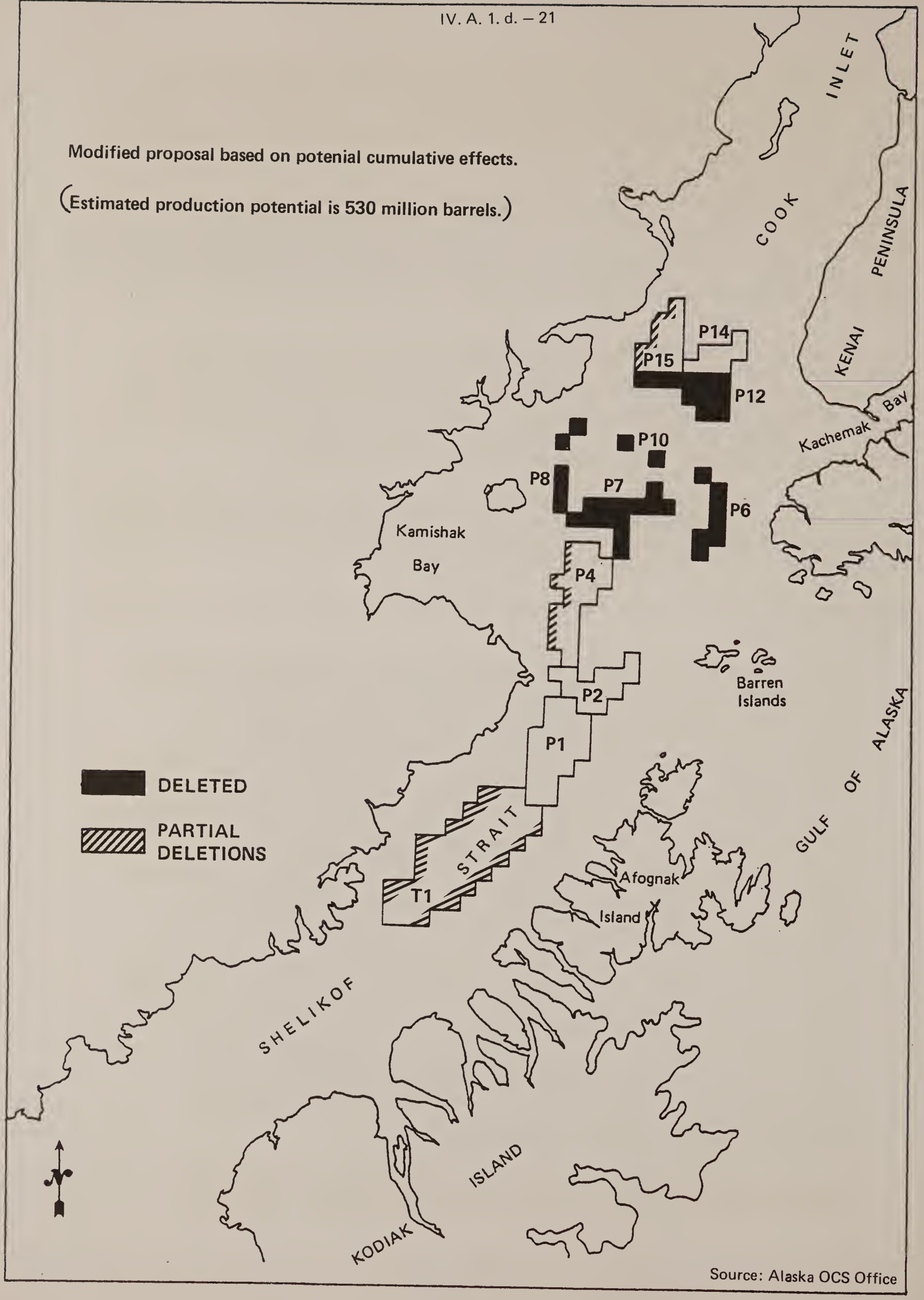
The effect of oilspills that impact the coastline has been described by Hayes and Ruby (1979).

There is abundant literature with case studies of the numerous major and minor oilspills that have taken place in the coastal waters of the contiguous United States and around the world. Predictive models for oilspill dispersal, spreading, bio-degradation, and physical degradation have been developed from these studies. The Arrow oilspill in Chedabucto Bay, Nova Scotia, probably comes closest to a comparative model for the sub-Arctic. However, the cleanup effort and later studies made very little reference to the special problems encountered as a result of the colder environment (i.e., oil on ice and snow; ice-oil interaction with beach sediments; oil dispersal in heavily iced environments, etc.). Studies of the Arrow spill strongly support the concept that physical degradation of spilled oil is directly related to the marine energy in the spill environment. Rashid (1974) gives strong supportive quantitative data in this regard. Further, evaporation losses and biodegradation are slower in colder environments. Biodegradation can be reduced as much as 90 percent in water of 0° C when compared to water of 25° C. Burning may be the only feasible method of cleaning oilspills in iced areas; however, this may represent a trade of one type of pollution for another. During the Buzzards Bay spill clean-up, burning was an effective method for cleaning oil which was not accessible from the shore. Only a small amount of particulate matter resulting from the fires was noticed.

Finally, intense tidal currents and winds in the study area can disperse the spilled oil in an unpredictable manner, making it

Modified proposal based on potenial cumulative effects.

(Estimated production potential is 530 million barrels.)



Source: Alaska OCS Office

> nearly impossible to recover before it impacts on nearby shorelines. It may not be feasible to recover or disperse oil slicks in regions of high tidal currents."

In Cook Inlet with its intense tidal currents, flushing is estimated to be 90 percent complete in 10 months (Kinney, et al., 1969). The same study concluded that microbiology degradation is much more important than tidal flushing in removing spilled oil from Cook Inlet.

Several indexes have been developed to estimate the persistence of oilspills on the coastlines. The Alaska Department of Fish and Game has developed a very good index (Map D in Alaska Department of Fish and Game, 1979). The Alaska Department of Fish and Game index is not described extensively in this section because only part of the area is indexed (only lower Cook Inlet). Also, the Alaska Department of Fish and Game index includes other factors than coastal vulnerability, such as oilspill trajectories and probabilities of areas being impacted by an oilspill. (For this EIS, oilspill trajectories have been extensively modeled by Dames and Moore (1980) and USGS (1980).)

Another index of the persistence of oilspills on coastlines has been developed by Michel, et al. (1978), and Hayes, et al. The results of this study are also described in chapter 8 of the Lower Cook Inlet Interim Synthesis (Science Applications, Inc., 1979) and in Blackburn (1979). The coastline has been categorized into morphological and sedimentary types with similar oilspill vulnerability ratings. The most vulnerable sections of the coastline are paraphrased below.

> Stable shorelines and tide-dominated bayhead depositional systems: Stable mountainous shorelines are dominated by steep valley walls, pocket beaches of mixed sand and gravel and extensive tidal flats. Stable lowland and hilly shorelines are generally sediment starved and fronted by thin tidal flat deposits covering wide rock platforms. Extensive sand waves and shoals, mud flats, and salt marshes are found in the depositional zone at the head of tidally dominated bays. Almost all areas are subject to long-term oilspill damage, especially salt marsh areas and tidal flats; fewer problems at the mouth than at the head of the embayment. Lower parts of intertidal areas would be flushed by tidal currents; oil may not enter area if fresh water run-off is high.

Hayes, et al., estimate that spilled oil will persist on these parts of the coastline for 10 years or longer. (This estimate of persistence is very important for later assessments of the time period over which recreational, commercial, and subsistence fisheries may have to be closed as a result of a spill.) The locations of these stable shorelines and/or tide-dominated bayhead depositional systems in lower Cook Inlet are shown in dark red on graphic 2.

Another type of vulnerable coastline is described below by Hayes, et al.

> Deltas of heavy sediment laden streams entering areas of low wave energy and deltas of smaller streams. Low wave energy conditions and coarse grain size would allow oil to remain for years; fresh water plume would probably keep oil off delta during periods of high run-off.

Hayes, et al., estimate that spilled oil would persist on these sections of the coastline for several years. The locations of these deltaic shorelines in lower Cook Inlet are shown in light red in graphic 2.

Also, the coastline vulnerability along the southeastern side (Kodiak Island side) of Shelikof Strait has been described thoroughly by Hayes and Ruby (1979). The types of coastline which they consider most vulnerable to oil-spills are protected estuarine salt marshes and tidal flats.

The locations of protected estuarine salt marshes and/or tidal flats on the southeastern Shelikof Strait coastline are shown in dark red on graphic 2. Hayes and Ruby estimated, on the basis of past spills on similar coastlines, that spilled oil could persist in a toxic state in these localities for up to 10 years.

Another category of vulnerable coastline includes sheltered, rocky headlands and gravel beaches.

The locations of sheltered, rocky headlands and/or gravel beaches along the southeastern Shelikof Strait coastline are shown in light red on graphic 2. Hayes and Ruby estimated that spilled oil could persist in these localities for a year to as many as 8 years.

Along the northwestern side (Alaska Peninsula side) on Shelikof Strait, there have been only a few studies of coastline morphology and sedimentation. In the Kodiak Interim Synthesis Report (Science Applications, Inc., 1979) is a figure (C.4.1.a.) of coastal sediment or substrate types in Shelikof Strait. Muddy sediment, in which spilled oil might become buried most easily and persist longest, is shown to occur only at the head of Wide Bay.

Another study, the Alaska Intertidal Survey Atlas (Sears and Zimmerman, 1977), is very useful for determining coastal morphology and sedimentation. Some sections of the coastline have characteristics similar to those which Hayes and Ruby (1979) describe above for very vulnerable coastlines; i.e., tidal flats and estuarine marshes with muddy sediments in enclosed bays and lagoons. The location of sections of the northwestern Shelikof Strait coastline with these characteristics (as portrayed by Sears and Zimmerman, 1977) is shown in dark red on graphic 2. Hayes and Ruby (1979) estimate that spilled oil could persist for up to 10 years on coastlines with similar characteristics.

A slightly less vulnerable type of coastline was also identified by Hayes and Ruby. This type is characterized by sheltered or protected rocky headlands, and/or flat gravel beaches. The locations of sections of the northwestern Shelikof Strait coastline with these characteristics (as portrayed by Sears and Zimmerman, 1977) is shown in light red on graphic 2. Hayes and Ruby estimate that spilled oil will persist from 1 year to as many as 8 years on coastlines with similar characteristics.

The estimated persistence of spilled oil on coastline segments can be combined with the probability of the coastline segments being impacted by oilspills (sec. IV.A.1.d.) in order to determine the most vulnerable sections of the coastline. The relative vulnerability of the coastline segments will be further modified by the biological and socioeconomic resources of the coast-lines, as described in section IV.A.2.

f. Oilspill Response: Federal response capabilities and responsibilities in the event of an oil pollution incident are prescribed by the National Oil and Hazardous Substances Pollution Contingency Plan, published in final revised form March 19, 1980, by the Council on Environmental Quality. Since Federal contingency planning in Alaska had been done in accordance with earlier National Plans, information used here from Alaska regional planning documents is subject to revision, which is presently underway. Wherever possible, changes expected to be made in regional contingency plans to reflect the new National Plan will be cited.

The National Plan provides the framework for a geographically integrated Federal response capability and encourages the participation of State and local governments in coordinated preparedness and action. The National Response Team serves as the model for regional response organizations, makes available special forces and equipment to regional organizations, and serves an oversight capacity to evaluate and make recommendations for improving response capabilities nationally.

In Alaska, the entire coastal area is a geographic zone of responsibility covered by the Alaska Coastal Region Multi-Agency Oil and Hazardous Substances Pollution Contingency Plan. The Plan specifies responsibilities among Federal and State government agencies, and designates the primary responsibility for effecting a coordinated response to pollution incidents in the marine environment with the United States Coast Guard. In Alaska, as elsewhere in the nation, primary responsibilities for coastal and inland waters are divided between the Coast Guard and the Environmental Protection Agency (EPA), with the EPA assuming primary responsibility in those geographic areas upstream of tidal influence.

The Alaska Coastal Region Plan specifies governmental response to a pollution incident as primarily a function of the Regional Response Team (RRT), the On Scene Coordinator (OSC), and the Scientific Support Coordinator (SSC). The RRT is composed of Federal and State agency representatives and is chaired by the Chief, Marine Safety Division, 17th Coast Guard District, covering all of Alaska. (The new National Plan, oriented toward integrating coastal and inland waters pollution contingency planning, places the chairmanship jointly with the Coast Guard and the EPA.) The RRT is responsible for planning and preparedness actions prior to a pollution discharge and for coordination and advice during a pollution emergency. In addition to the Coast Guard, members of the Alaska Coastal RRT are designated representatives from the State of Alaska, the EPA, the Federal Emergency Management Agency and the following Federal departments: Agriculture, Commerce, Defense, Energy, Health and Human Services, Interior, Justice, Labor and State. The previous National and Regional Plans had differentiated between primary and advisory members. All representatives now have equal status, as would representatives of local governments designated to participate in the activities of the RRT. And, as at the national level, the Coast Guard additionally maintains and operates the Regional Response Center, in Alaska at the District Headquarters in Juneau.

Alaska coastal waters are divided into geographic zones of responsibility for which an On Scene Coordinator (OSC) is predesignated by the Coast Guard. The designated OSC for the lease sale area is the Commanding Officer, Marine Safety Office, Anchorage. The function of the OSC is to develop and maintain a Federal local contingency plan for Federal response in the area of the OSC's

responsibility; and, at the scene of a discharge, to serve as the single point of contact for advising the spiller on cleanup measures or, if necessary, to coordinate and direct the Federal response and expedite pollutant removal efforts. The OSC provides information to and receives advice from the RRT during a spill emergency. The Scientific Support Coordinator (SSC), provided by the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, is on the staff of the OSC at the scene of a spill to provide scientific advice and mediate advice from the scientific community on the scene.

To assist the RRT, OSC, and SSC in performing their duties, there are national special forces on call, such as the Pacific Strike Team of the Coast Guard and the Environmental Response Team established by the EPA; a computerized national inventory of pollution response and support equipment for locating specialized equipment tailored to the characteristics of the spill; memoranda of agreement and interagency agreements to explicitly define areas of responsibility in cases where ambiguity among agency responsibility may exist; and specialized funtional groups within the RRT to provide expertise and leadership in areas such as public information, pollution control techniques, damage assessment, and protection of different types of living marine resources.

Petroleum Industry Oilspill Response Organizations: There are two petroleum industry oilspill response organizations operating in the lease sale area, the Cook Inlet Response Organization (CIRO) and the Gulf of Alaska Cleanup Organization (GOACO). These response organizations are made up of a number of petroleum industry companies and operate through voluntary private industry agreement to jointly acquire oilspill containment and cleanup equipment, train personnel in its deployment and use, and provide a pooled capability of response greater than any individual company could provide alone.

GOACO was formed in 1975 in preparation for exploratory drilling in the OCS lease sale area 39 in the Gulf of Alaska. Composed of five member companies, GOACO maintains an inventory of equipment originally costing in excess of one million dollars. The organization has a manager housed in Anchorage, with equipment and materials based in Anchorage, Yakutat, and Kenai. CIRO was formed in 1978 as a joint venture of 13 petroleum companies operating in the Cook Inlet area. Equipment, originally costing approximately $1.3 million, is maintained in Anchorage, Kenai, Nikiski, and Homer. A manager is housed in adjacent offices with GOACO for coordination purposes. Much of the GOACO equipment currently is under the temporary control of CIRO due to the lack of offshore drilling activity in the Gulf of Alaska. CIRO currently is organizing the Cook Inlet Response Team to provide rapid initial response and follow up to an oilspill in CIRO's area on interest. Equipment and materials owned or under the control of CIRO and GOACO are listed in appendix E.

Petroleum Industry Oilspill Contingency Planning: Each of the petroleum industry oilspill response organizations in the lease sale area has produced and continues to maintain an oilspill contingency plan, which essentially is a compilation of information needed by on-site response personnel. Such information generally includes inventories and operating characteristics of equipment resources; lists of supplies and purveyors of containment and cleanup services and supplies; procedures for containment, cleanup and disposal; the names and phone numbers of specific individuals in key government and business organizations; and organizational policy and operating agreements with other firms.

Additionally, the industry response organizations in the lease sale area belong to the Alaska Cooperative Oilspill Response Planning Committee (ACORP), an informal organization formed in 1977 among the Alaska Department of Environmental Conservation, the United States Coast Guard, and the petroleum industry in Alaska. The ACORP Pollution Response Plan is intended to provide the means to coordinate Federal, State and petroleum industry resources in response to a significant oil pollution incident in coastal waters of Alaska. The Plan provides for the sharing of resources, including equipment and technical expertise, among public and private spill response organizations and specifies procedural and fiscal terms and conditions for such sharing. Besides facilitating cooperative oilspill response, the Plan allows the spiller (the responsible party in a spill incident) to gain access to State, Federal and industry oilspill and logistic equipment, technology, and manpower.

Oilspill Preparedness by OCS Lessees: The revised Outer Continental Shelf orders governing oil and gas lease operations (FR 12/21/79) specify requirements of OCS lessees for oilspill preparedness. OCS Order No. 2 (drilling operations) requires the lessee to submit with the Exploration Plan or Development and Production Plan evidence to the Oil and Gas Supervisor (of the USGS) of the fitness of the drilling unit to perform the planned drilling operation, such evidence to include information on pollution prevention equipment associated with the drilling operation. Based on past experience, minimum equipment and supplies for initial containment are based at the drilling site, usually including an inflatable containment boom, a mechanical oil skimming device, a storage container for cleaned up oil, sorbent pads, surface collecting and dispersant chemicals and chemical applicators. (See the June, 1979 revised oilspill contingency plan for exploratory drilling in OCS lease area CI, listing equipment aboard the Atlantic Richfield Company vessel Ocean Bounty. Also see the GOACO Oilspill Cleanup Manual of March, 1977, listing onboard equipment for drilling vessels SEDCO 706, Ocean Ranger, and Alaska Star.) The operational capabilities of the containment booms generally (based on manufacture type) are to function in waves up to 5 to 6 feet and in winds of up to 20 to 25 knots. Oil skimming equipment of the type generally on board operates in waves up to 2 to 3 feet in height, whereas sorbent booms and pads are used only with contained spills.

OCS Order No. 7 prescribes measures required of each lessee for pollution prevention and control. Included are requirements for inspections and reports, pollution-control equipment and materials, oilspill contingency plans and annual drills and training of personnel. Oilspill contingency plans are required of each lessee, submitted for approval to the Oil and Gas Supervisor (of the USGS) with or prior to submitting an Exploration Plan or a Development and Production Plan. Required in the contingency plans are information on response equipment and deployment times, response capability for varying spill severity, the means for identifying and protecting areas of special biological sensitivity, procedures for notifying key personnel, and provisions for response action at the scene of a spill. Pollution control equipment and materials are required to be maintained by, or available to, each lessee at an offshore location or at a location approved by the Supervisor. Such equipment and materials are required to be available prior to the commencement of drilling and production operations. For example, in the case of OCS sale 39 exploratory drilling off Yakutat, pollution control equipment and materials were in place in Yakutat and Seward as well as on the drilling vessel itself.

Cleanup Policies and Techniques: According to the Alaska Coastal Region Plan, the primary consideration in any spill response is the protection of life and property, followed by protection of the natural environment. (Endangered and threatened species identified by Federal law are also specifically addressed in the new National Plan.) Action to protect critical areas and remove pollutants therefrom takes priority where total removal of the pollutant from the environment is not possible.

Mechanical methods and sorbents are preferred in Alaskan waters for control of the source of discharge as well as the containment and removal of the pollutant. The use of chemical agents is governed by the National Plan and the circumstances of the spill. Generally, approval for use of chemical agents must be obtained from the senior EPA representative on scene at the spill on a case-by-case basis, after consultation with other appropriate State and Federal representatives. Exceptions to this general rule are for the use of surface collecting agents in accordance with the National Plan listing of approved chemicals where the use of chemicals will reduce the immediate hazards to human life due to explosion and/or fire.

Oilspill Incident Response: The Federal Water Pollution Control Act requires that all harmful discharges of oil and all discharges of hazardous substances into the navigable waters of the United States must be reported immediately to the appropriate Federal authority. The designated "authority" in Alaskan coastal waters is the United States Coast Guard. The Coast Guard can be contacted in the following ways:

1. Calling the toll-free number ZENITH 5555.
2. Calling the designated OSC for the area in question. In the case of the lease sale area, the OSC is Captain R. H. Spoltman, 907-271-5137.
3. Calling any Coast Guard unit in the vicinity of the incident.
4. Calling the Commander, 17th Coast Guard District in Juneau, 907-586-7195.

The OSC has the responsibility to respond to all reports of spill incidents. Oilspills in coastal waters are classified according to the National Contingency Plan by the amount or potential amount of discharge, as follows:

Minor discharge: less than 10,000 gallons
Medium discharge: 10,000 to 100,000 gallons
Major discharge: more than 100,000 gallons

The report of the existence or potential of a major spill, even an unconfirmed report, requires the OSC to immediately notify the National and Regional Response Centers. A minor spill normally will not require the OSC to alert the full membership of the RRT, but the decision to do so is based on the judgment of the OSC after investigating the spill report. Alerting the membership of the RRT usually is carried out by telephone conference call and normally is cause for activating the full or partial membership of the team to the scene of discharge.

Federal policy strongly encourages those responsible for a spill take appropriate abatement and cleanup actions voluntarily. When the responsible spiller takes appropriate actions, the OSC will observe and monitor progress and provide advice and counsel to the spiller. Federal cleanup activities are instituted when 1) the spiller is unknown or 2) in the judgment of the

OSC, the spiller does not act promptly, does not take an interest to take appropriate cleanup action, or is unable to take adequate cleanup measures.

If an alleged spiller can be identified and cleanup is required, the OSC must immediately notify the owner, operator or appropriate responsible party in writing of Federal interest, his liability for cleanup, and other aspects of the Federal Water Pollution Control Act or National Contingency Plan as appropriate. If the alleged spiller fails to initiate cleanup activities, or initiates improper or inadequate cleanup actions, the OSC must advise the spiller in writing that his actions are considered inadequate and that he is liable for cleanup costs incurred in the event of a Federal cleanup. Such notice failing, the spill incident becomes a Federal responsibility.

g. Constraints on Oil and Gas Development: Potential geologic, oceanographic, and meteorologic hazards could restrict site selections for onshore or offshore facilities, and limit development of special engineering designs of facilities and operational precautions to meet the environmental conditions according to OCS Order No. 8 (appendix C).

The following describes the more significant potential natural hazards that could affect OCS development. Less significant potential oceanographic hazards such as sea ice, low or freezing air temperatures, and winds were considered during the environmental analysis but found not to be significant enough to require detailed treatment here.

Seismicity and Earthquake Associated Hazards: The environmental geology graphic (graphic 1) describes several aspects of large magnitude earthquakes and their effects on areas adjacent to the proposed lease area. According to a report by Thenhaus, et al. (1980), the proposed lease area occurs in a zone where the ground acceleration ranges from 40 to 60 percent of gravitational acceleration for those earthquakes with a 500-year return period. Estimates of great earthquake recurrence intervals range from a minimum of 33 years to a maximum of 800 years (Plafter, 1971).

The most significant constraint earthquakes pose to potential OCS development is the design of onshore and offshore facilities. These facilities should be designed to safely withstand large magnitude (greater than 6.5) earthquakes. Both onshore and offshore bottom-founded oil and gas facilities should also withstand ground accelerations predicted by Thenhaus, et al. (1980). In the lower Cook Inlet and upper Shelikof Strait, ground shaking could be quite severe and platforms would have to adequately withstand it. If an offshore production platform fails or a pipeline ruptures due to seismically induced slumping or foundation failure, an oilspill could occur. However, potential slump areas in lower Cook Inlet and northern Shelikof Strait have not been found (Bouma and Hampton, 1979).

In the event of structural failure of an offshore production and storage facility, the lives of personnel onboard would be endangered. Severe financial losses could occur. Oilspills could occur depending on the nature of damage to pipes, wellhead facilities, feeder pipelines, and storage facilities. See section IV.A.1.d. for probabilities of oilspills.

Industry has attempted to design earthquake-proof platforms, one of which Exxon recently installed in the Santa Barbara Channel. The platform is a

290-meter production platform designed to withstand 500 cm^2/sec horizontal ground accelerations.

Production wells are required to have subsea safety valves which will shut off flow from the wells in the event of an earthquake.

Mass Movement: During some earthquakes, fine, well-sorted sandy or silty soils, especially water-saturated soils, could liquefy, lose bearing strength, and tend to slide or slump downslope. Landslides or mudflows could occur and threaten onshore facilities located in the area. The apparent stability of the sand wave field in lower Cook Inlet suggests that this large mass of sand has not been affected or significantly moved due to earthquakes in lower Cook Inlet.

Tsunamis: Both local and regional tsunamis can be generated by earthquake-induced submarine mass movements or tilting of the sea floor. Such tsunamis have the potential to severely threaten the physical existence of coastal communities and OCS development facilities, especially at elevations less than 30 meters above sea level.

The seismic sea wave warning system was established in 1948 by the U.S. Coast and Geodetic Survey. Advance notices of tsunamis are issued throughout Pacific coastal areas. Improved earthquake and tsunami warning systems have been installed in Alaska since 1964 to provide better and faster warnings to threatened coastal areas. Historically, Port Graham and English Bay coastal areas were severely impacted by a cross-inlet tsunami generated by volcanic activity on Augustine Island.

Tsunamis generated by a mudflow or large slump near Augustine Island could affect some coastal areas such as Port Graham and English Bay. Tsunamis can potentially rupture oil storage tanks, as well as overturn or severely damage oil tankers in ports.

In coastal areas, the best protection for onshore facilities is a careful site selection and design procedure with all due consideration being given to the potential occurrence of tsunamis.

Faulting: Faults pose moderate hazards to offshore drilling in lower Cook Inlet and upper Shelikof Strait (see graphic 1). During earthquakes, active faults and their movement pose potential problems for sea floor completion facilities and pipelines. Pipelines could be ruptured if much displacement occurred along a fault crossing a pipeline route.

In addition, if high abnormal formation pressures exist at producing horizons, and a serious oil blowout occurs, then active shallow, near-surface faults could prove to be potential hazards for oil and gas to reach the sea floor outside the well casing. Such a situation would represent a worst case scenario for a blowout. However, blowouts occurring inside the well casing have a much better chance of being brought under control more rapidly.

Volcanoes: Volcanoes along the Aleutian-Alaska Peninsula Cook Inlet area are the result of weak areas in the convergence between the North American and Pacific plates. Nineteen volcanoes exist in this region, eight of which have erupted in the last 100 years. OCS operations and facilities located on or

very close to Augustine Island in lower Cook Inlet would most likely be affected by potential hazards of the Augustine volcano. The proposed lease area in upper Shelikof Strait probably would be more affected by a significant eruption of Mt. Katmai than Augustine. The 1912 Katmai eruption was one of the world's largest in this century.

The major potential hazards of Augustine Island are glowing avalanches (pyroclastic flows), mudflows and floods, minor lava flows, bomb and ash falls, noxious fumes, poisonous gases and acid rains, and tsunamis. Of these the most serious hazard to offshore oil and gas development is the glowing avalanche. Ballistic studies indicate that the ejection range of large bombs is mainly restricted to the island itself.

The proposed lease area in lower Cook Inlet could be affected by bomb and ash falls, and possibly noxious fumes due to a hot glowing ash cloud moving up to perhaps 9.6 to 16 kilometers offshore of Augustine Island. Acid rainfalls over the lower Cook Inlet area could also occur. Ash from the past eruption spread over southern Alaska, as far north as Anchorage and Talkeetna, and as far east as Sitka, 1100 kilometers away. Ash dispersal is strongly dependent on the prevailing winds. No place on Augustine Island is safe to erect permanent or semi-permanent structures.

Protection from such atmospheric effects of a volcanic eruption on Augustine could be mitigated by adequate public notice of volcanic activities.

The 1883 eruption produced tsunamis that crossed the entire lower Cook Inlet. The tsunami warning system, the Palmer Seismic Observatory, the Geological Survey, and the University of Alaska scientists studying Augustine Volcano could provide OCS operators notice of any impending potential volcanic eruptions on Augustine.

Neither ash fall nor acid rainfalls have the potential to affect offshore production platforms, pipelines, tanker terminals, or vessel traffic to such an extent that a major oilspill would occur. However, personnel, air intake filters, and exposed mechanical equipment could be affected by either acid rainfalls or abrasive ash deposits.

Conclusion: Table IV.A.1.g.-1 summarizes physical constraints which could affect various types of oil and gas operations in the proposed lease area.

Most potential geologic hazards in either lower Cook Inlet or Shelikof Strait can be mitigated by adequate compliance with OCS Operating Orders and appropriate facility design, but very low probability, high cataclysmic events such as major earthquakes, major volcanic activity, or major tsunamis cannot be completely ruled out.

OCS Operating Order No. 8 mitigates most potential hazards by requiring that offshore facilities design complies with Geological Survey standards.

Large magnitude earthquakes and ground shaking could damage OCS-related onshore facilities, especially oil storage tanks.

Ash falls and acid rainfalls due to volcanic eruptions could adversely affect OCS personnel and equipment.

Table IV.A.1.g.-1
Sale 60 - Lower Cook Inlet/Shelikof Strait
Estimated Physical Constraints on
Oil and Gas Development

ENVIRONMENTAL FACTORS	ONSHORE DEVELOPMENT					OFFSHORE DEVELOPMENT		OFFSHORE EXPLORATION		
	Gas Pipeline	LNG Plant	Support and Supply Base	Oil Terminal	Pipelines	Submarine Pipelines	Production Platforms	Bottom-founded Platforms	Jack-ups	Drillships	Semi-Submersibles
Earthquake Magnitude	H	H	H	H	H	H	H	H	L	L
Ground Shaking or Breaking	H	H	M	H	H	H	H	H	L	L
Mass Movement (slumping, landslides, mudflows, liquefaction of soils, and avalanches)	H	H	M	H	H	H	H	H	L	L
Faulting	M	L	L	L	M	M	L	L	L	L
Gas-Charged Sediments	L	L	L	L	L	L	M	M	M	M
Tsunamis	L	H	H	H	L	L	L	L	L	L
Storm Waves	L	L	L	L	L	L	M	M	L	L
Sediment Transport and Seabed Bedforms	L	L	L	L	L	M-H	M	M	L	L
High Abnormal Formation Pressures	L	L	L	L	L	L	M-H	M-H	M-H	M-H
Coastal Erosion	L	L	M	L	M	M	L	L	L	L

Note: The H (high), M (medium), and L (low) designations are based on a combined assessment of (1) the severity of potential environmental hazards to oil and gas operations, (2) the availability of technical information necessary to either develop or implement appropriate offshore technological systems, and (3) the extent of the relative availability of present and future technology in response to potential natural hazards.

The coastal effects of a seismically or volcanic induced tsunami could be devasting, but appropriate consideration of tsunami potential during actual onshore facility siting and design would considerably reduce the risk to human life by tsunamis.

The large sand wave field in lower Cook Inlet appears to have been relatively stable over a 5-year period of time. In view of this, the potential risk to seabed pipelines crossing the sand field could be considerably reduced. Selective pipeline routing in and around the sand field could also minimize the potential hazard of the sand field to seabed pipelines.

Cumulative Effects: The cumulative effect of potentially recurring earthquakes close to oil and gas facilities in lower Cook Inlet or upper Shelikof Strait could result in repeated occurrences of severe damage to such facilities. Repetitious, severe earthquakes over the life of the project could result in significant losses to physical facilities, human resources, and the local lifestyle and economy. However, given appropriate facility design and compliance with local, State, and Federal regulations such occurances would be considered unlikely.

Unavoidable Adverse Effects: A very large magnitude earthquake close to offshore facilities or any other onshore development areas, as well as an attendant potential tsunami, could cause very serious physical damage to OCS-related facilities; e.g., historically, tsunamis have damaged Kodiak, Port Graham, English Bay, and Homer.

h. Other Major Projects Considered in Analyzing Cumulative Effects: This section contains a brief description of major projects which may occur, in the near future, within or close to the sale area. Ongoing projects are not considered in this section. For the purpose of this DEIS they will be considered as part of the baseline environment. The projects listed in this section have been considered in the cumulative effects sections of this document. The listing is not comprehensive. Other specific projects which are not major or which occur at some distance from the sale but which are felt to be germane to a discussion of a particular topic are incorporated within the pertinent cumulative effects section.

Beluga Coal Field: The Placer Amex Company is currently planning to mine the Beluga Coal Fields on the west side of Cook Inlet. The coal will be strip mined for export or will be used to satisfy local energy needs. According to the Placer Amex's development scenarios, coal mining and exporting activities would begin in 1990 or 1991. A local town of 1,300 residents could develop around the field.

The produced coal will be either shipped in bulk form, as methanol or as coal slurry. Although it is unknown exactly where the shipping terminal for the Beluga field will be located, it is proposed that the methanol option would utilize the Drift River-Granite Point oil pipeline and would load traffic at the Drift River facility. To be economically viable the field would have to annually yield 6×10^6 tons of coal for shipment. If converted into slurry, it would take approximately 60 tankers per year of the 100,000 DWT cargo category to move the product.

Bradley Lake Hydroelectric Project: Bradley Lake occupies an ice scoured basin in the Kenai Mountains, some 36 air miles northeast of Homer. The Corps

of Engineers proposes to construct a concrete gravity dam at the point where Bradley Lake flows into Bradley River. The dam will be capable of generating 70 megawatts of power with a future maximum capacity of 118 megawatts. The Bradley Lake dam was originally expected to be constructed in the mid-60's; however, the discovery of oil and gas in the Cook Inlet deprived the proposed dam of its energy market area and postponed its construction. Presently, the earliest funding approved possible will allow Bradley Lake construction to begin in 1983.

Materials and equipment needed to construct the dam could be brought on site by two methods. First, a road could be constructed from Homer to Bradley Lake. A second idea under consideration would result in the barging of all materials to a dock facility located at Bear Cove and then transported overland to the dam site. The site of the construction base camp for the dam is unknown but could possibly be Homer.

Pacific LNG Plant: In spring of 1982, construction should begin on a natural gas liquefication plant located at Nikiski, Alaska. The plant, operated by the Pacific-Alaska LNG Company, will have a peak liquefication capacity of 400 million cubic feet per day, and will require about 59 acres of land. The facility will be located on borough owned lands, and will be part of an existing industrial park which contains the Tesoro refinery, the Standard refinery, the Chugach Electric power company, the Phillips LNG plant, and the Colliers Ammonia and Urea facility. Erection of the Pacific LNG plant will require the addition of one loading dock, and will generate between 50 to 60 loads of LNG per year. The LNG tanker size employed will probably be of the 130,000 cubic meter class.

Peak employment during the construction phase of the Pacific plant will require some 1,200 workers. Annual employment during the production phase of the plants life would be 65-75 people. Total life of the plant will be between 20 and 40 years.

Homer Harbor and Fisheries Industry Expansion: The city and port of Homer have been targeted by a number of organizations for various types of harbor expansion and bottomfish industry development schemes. Of the various proposals, three have advanced to the point of actual construction or near construction.

First, the Homer Fisheries Industrial Park, operated by Douglas Sweat, would provide industrial fisheries lots for the siting of marine oriented private industries, such as fish and shellfish processors, tug and barge operations, marine repair firms, and marine service companies. The Homer Fisheries Industrial Park would occupy 65 acres each. At peak operation the project would employ 130 people. The Homer Industrial Park has obtained construction approval from the Corps of Engineers; however, adequate private funding has not been forthcoming.

Second, the World Seafood Corporation is currently constructing a large bottomfish processing facility on the Homer Spit, north of the small boat harbor. The facility will be able to process 1,800 metric tons of fish per hour. The facility should require 30 people to build it and 40 to operate the facility year round.

Third, the city of Homer is proposing the expansion of its existing small boat harbor, and the construction of a new 1,400-foot dock. The new dock would reach into Kachemak Bay, and would provide Homer with the capacity to service deep draft vessels. Total costs of the projects would be about 20 million dollars. The new dock and expanded small boat harbor would be designed to serve many interests, including development of existing commercial fisheries, development of a bottomfishing industry, and OCS related development. Approval of the project is pending; it should be constructed in the early 1980's.

Kodiak Small Boat Harbor: The Corps of Engineers have proposed to build a second small boat harbor in the vicinity of Kodiak city. This proposed action has been funded by Congress, and work will probably begin on the project in the early 1980's.

Present harbor capacity (in Kodiak) leaves some 580 fishing vessels without protected mooring space. Dog Bay, the proposed small boat harbor site, is a 100-acre site, located on the southwestern side of Near Island, across a narrow channel from the city of Kodiak. Within Dog Bay, an area of 45 acres fulfills the city's current 25-acre mooring space requirement, and leaves 20 acres for potential space growth.

Port Lions Small Boat Harbor: Currently awaiting congressional funding approval is the Corps of Engineers' proposed Small Boat Harbor at Port Lions on Kodiak Island. The proposed Corps project is located at Settlers Cove at Port Lions. The purpose of the project is to provide safe anchorage for the local fleet of 52 commercial fishing boats, and a transient fleet in excess of 128 commercial fishing vessels. The harbor will also provide refuge for increasing numbers of sport fishing and recreational boats. The project will consist of two rock-fill breakwaters located across the mouth of Settlers Cove enclosing an area of 52 acres.

Proposed OCS Lease Sale 61: An evaluation of cumulative effects in regard to lease sale 61 is not included within this DEIS. For such an evaluation to be made, at minimum, the Alaska OCS Office would have to know what the sale 61 resource estimates will be, what the areas of particular interest will be to industry, government, and special interest groups, and finally, what the area selected for further study (e.g., the proposal) will be. As none of this information is presently available, there is no basis on which to make an environmental assessment of the sale 61 area; hence, no viable assessment of the interrelationship of the two sales is at this moment possible. However, unless lease sale 60 is cancelled, an evaluation of the interrelationship of sales 60 and 61 will be performed in the sale 61 DEIS.

Lower Cook Inlet Sale: To date some seven dry holes have been drilled as a result of OCS sale CI. ARCO is scheduled to drill one more well in the fall of 1980. Unless a significant oil and/or gas find is soon located within the boundaries of the sale area, industry activities will probably cease.

2. Alternative I - Proposal (153 blocks): The following sections assess the impacts of oil and gas leasing in the proposed sale area (see fig. II.B.1.a.-1).

a. Impacts on Vulnerable Coastal Habitats: A coastal habitat is defined here as a geographic area, bounded by the highest tide line shoreward and a 20-meter (65.6-ft) depth oceanward, within which living organisms reside. Coastal habitats and associated organisms are especially vulnerable to oilspills. On some sections of the coastline, spilled oil may persist for up to 10 years (sec. IV.A.1.e.). Another factor which makes coastal habitats especially vulnerable is that they are the main areas within which a wide variety of sensitive and valuable species reside. The probable impacts on some of these species are described in more detail in section IV.A.2.b. (razor clams and nearshore larval fish), IV.A.2.e. (sea otters and coastal marine mammal rookeries), and IV.A.3.h.(4) (intertidal organisms that are harvested as subsistence foods). These coastal organisms and habitats, which essentially surround the proposed lease area as described in section III.B.1., may be primarily impacted by oilspills, but also by discharges of drilling fluids and by disturbance during construction.

Oilspills: Four major oilspills are most likely to occur as a result of the proposed lease sale (sec. IV.A.1.d.). These major spills have a high (94%) likelihood of contacting the surrounding coastal habitats within 10 days (while the oil is fresh and still quite toxic). Spills of natural gas are not included in these calculations because of the rapid evaporation of gas and thus, lack of impact.

Major oilspills include all oilspills over 1,000 barrels. Oilspills due to blowouts on the U.S. outer continental shelf (more than 3 mi from land) have averaged about 2,000 barrels in size (Council on Environmental Quality, 1974). Oilspills from pipelines, which may occur close to shore, are typically small because the flow can be controlled. Tanker spills, which may also occur quite close to land, are usually very large. The impact of tanker spills on coastal habitats can be estimated with the amount of oil spilled during three past tanker accidents, and with the amount of coastline that was affected. A 1970 discharge of "hundreds of barrels" of oil ballast water from a tanker near Kodiak Island affected portions of its coastline for 150 kilometers (93.2 mi).

The Metula tanker spill in the Straits of Magellan impacted 150 kilometers (93.2 mi) of rocky coastline with a large amount of crude oil. The Arrow tanker spill in Nova Scotia impacted a 25-kilometer (15.5-mi) stretch of deeply indented, rocky coastline with about 70,000 barrels of Bunker C fuel oil. The accidents indicate that a major tanker spill may affect a 25- to 150-kilometer (15.5-93.2 mi) stretch of rocky coastline. This distance equals one-sixth to one-half of Kodiak's westside coastline; i.e., a tanker spill may impact a very long segment of coastal habitat.

As will be discussed later in the paragraphs on "Cumulative Effects," it is important to understand that a definite risk already exists of tanker spills in Cook Inlet and near Kodiak Island. For example, spills associated with only the proposed lease sale have a 9 percent probability of contacting Augustine Island within 10 days, but spills associated also with the existing leases and the existing tanker traffic have a 49 percent probability of contacting the island (sec. IV.A.1.d.).

Oilspills that contact coastal habitats can have a very toxic affect on the biota. A previous environmental statement for the Kodiak Area (DOI, p. 43, 1977) concluded about oilspills:

> "Maximum adverse impacts would occur on the upper and mid-intertidal zone, in areas of extensive semi-protected or protected heavily vegetated coastline. Inshore bays and estuaries having muddy and sandy bottoms and limited circulation patterns would also be severely impacted."

As described in section IV.A.1.e. (Oilspill Persistence), spilled oil may persist for 10 years on tide-dominated bayhead depositional coastline. Other vulnerable types of coastline are protected estuarine salt marshes and tidal flats, deltas, sheltered rocky headlands, and gravel beaches. Infauna, such as razor clams, are one of the main organisms that might be affected by oilspills contacting the coastline. After the Amoco Cadiz tanker spill in France, many razor clams died. Razor clams in Shelikof Strait and lower Cook Inlet occur in large, commercial concentrations in several areas (see graphic 2). Oilspills resulting from the proposed lease sale have over a 40 percent likelihood of occurring and contacting at least one of the important razor clam beaches (see appendix D). Most of these beaches have an oilspill persistence rating (sec. IV.A.1.e) of less than 1 year, so the toxic effect of any spill on the razor clam population may persist for that length of time. Even if the razor clams are not killed, a spill may taint the clams and the area would likely be closed to clamming. After an oilspill in another area (Buzzards Bay, Massachusetts) all of the shellfish beds on the eastern shore of the bay were closed for one and a half years (Palmer, 1980).

The effect of a closure would be most disruptive along the eastern part of lower Cook Inlet where a million razor clams are removed annually by sport fishermen (sec. III.B.2.d.). As indicated by the oilspill model, size of spills, and persistence index (secs. IV.A.1.d. & e.), there is an additional 9 percent chance that spills from the proposed lease area may affect a large portion of these razor clam beaches for 1 year during the life of the project.

In northwestern Shelikof Strait near Swikshak, up to $100,000 worth of razor clams have been harvested annually by commercial fishermen. The impacts of oilspills on commercial harvests of razor clams are discussed further in section IV.A.2.b. and c.

Hydrocarbons dissolved in water below a fresh surface slick may kill or taint the scallops on the shallow water banks, but the toxic affect would not persist long because of the continual flushing action of the water on the shallow-water banks. Spills from the proposed lease area have an additional 7 percent chance of impacting within 3 days (while a slick is still fresh) the shallow-water banks on which scallops are harvested (shown on graphic 2, see also appendix D, and sec. IV.A.1.d.).

The risk of oilspills to other coastal organisms, such as herring, which spawn on kelp in certain areas, is discussed in other sections (IV.A.2. biological sections). In additon to specific organisms, some entire bays are sensitive habitats and/or are used extensively for commercial and subsistence purposes. One of these bays is Kachemak Bay; interestingly, the bay has a negligible chance of being impacted by additional spills from the proposed lease area (sec. IV.A.1.d.). Kamishak Bay has a much higher chance (29%) of being impacted by additional spills within 10 days of the accident. (As stated earlier,

a risk which is actually twice as large is posed to Kamishak Bay by the existing tracts and tanker routes.) The deeply indented bays on the northwest side of Kodiak Island have a substantial, additional risk of being impacted. For example, Kupreanof Strait alone has an additional 23 percent probability of being impacted by additional spills. In these bays along the northwest coast of Kodiak Island, many coastal organisms are harvested as subsistence food (sec. III.C.1.d.). The subsistence foods include vulnerable infauna organisms, such as the razor clams, and slightly less vulnerable intertidal and subtidal organisms, such as sea urchins.

For the proposal, oil is hypothesized to be transported by pipe through Kupreanof Strait to Talnik Point, and by tanker through Marmot Bay. The oilspill risks posed by these activities are primarily associated with the development scenario (appendix A, the proposal), i.e., with later decisions about whether and how to produce a field if one is discovered. Later decisions about pipeline routes may substantially change the risks. For example, a pipeline to the Shuyak Strait area rather than to Kupreanof Strait area displaces about one-third of the projected impact away from the Kupreanof Strait area.

Discharges: The toxic discharges that are associated with the proposed action include drilling muds and formation waters. Drilling muds are mainly inert clays, but contain some toxic components and trace amounts of hazardous heavy metals, as described at a recent symposium on the environmental rate of drilling fluids (Alaska Petroleum Institute, 1980). All of the components are rapidly diluted upon discharge in turbulent deep water, as in lower Cook Inlet (Dames and Moore, 1978):

> "The results indicate that, in most cases, within a few meters of the discharge point, drilling fluids were well below concentrations expected to cause mortalities in the most sensitive organism tested. For a short period (up to 3 hours) discharges during "cementing" of the well and at the end of the well resulted in calculated concentrations of drilling mud within a few meters of the discharge that exceeded levels found to be toxic in the 96-hour laboratory tests."

Since none of the drilling locations are, of course, within 3 miles of land where the water is shallower and less turbulent, toxic concentrations would not accumulate.

Formation waters may be discharged (if oil is discovered). Formation waters can be quite toxic to organisms, as observed around a drilling rig in a very shallow (2.5 m or 8.2 ft) bay (Armstrong et al., 1979). As in the above paragraph, any platforms where formation waters might be discharged will, of course, be 3 miles from land. The minimum water depths in the proposed lease area are: in lower Cook Inlet, about 10 meters (32.8 ft) on the very turbulent bank just south of Kalgin Island; and in Shelikof Strait, about 20 meters (65.7 ft) along the northwestern shore. Because of the water depths and turbulence, there would be no toxic affect of formation waters on organisms.

Disturbance: Pipelines that cross the shoreline would cause some disturbance of coastal habitats. Two oil pipelines and one gas pipeline that cross the shoreline are hypothesized for the proposal. Burial of these pipelines would destroy a strip of benthos and intertidal organisms about 5 meters (16.4 ft)

wide. If the pipeline routes cross densely populated habitats, such as kelp beds, the impact could be severe. Coastal areas in lower Cook Inlet in which pipeline burial would be least disruptive have been identified by the Alaska Department of Fish and Game (1979). Utilization of this publication during post-lease routing of pipelines could result in greatly minimized impacts.

Conclusion: Neither discharges during the exploratory and/or production phases, nor habitat distrubance during the development phase would cause any substantial impacts to vulnerable coastal habitats. In contrast, oilspills may cause occasional large-scale impacts. Four additional, major spills are most likely to occur as a result of the proposed leasing; these spills have a 94 percent chance of impacting the coastal habitats and infaunal organisms which almost entirely surround this particular OCS area. Oilspills that impact the coastal habitat would probably kill or temporarily taint for up to 1 year infaunal organisms, such as the razor clam, which are valuable for recreational, commercial, and subsistence purposes. The costs of oilspill impacts to the coastal habitats and infaunal organisms would not be costs which only the fishermen, the surrounding communities, and the State would necessarily assume because of the existing Offshore Oil Pollution Compensation Fund (appendix F).

Cumulative Effects: The oilspill risks to the coastal habitats that are summarized above are actually smaller than the already existing oilspill risks. The existing risks are due to the oil and gas leases from the previous OCS sale CI and to established oil tanker routes for adjacent fields in upper Cook Inlet. The existing and the proposed activities are most likely to result in eleven major oilspills which have over a 99.5 percent chance of impacting the surrounding coastal habitat and infaunal organisms (sec. IV.A.1.d.). This projected number of spills from the activity within lower Cook Inlet and Shelikof Strait means that the described impact of an oilspill on coastal habitats may actually become continual impacts, causing some reduction over the life of the field in the abundance and availability of important infaunal organisms.

Unavoidable Adverse Effects: Oilspills are due to accidents, so the oilspill impacts are not entirely avoidable. Oilspill response capabilities (sec. IV.A.1.f.) have been only partially successful with the reduction of impacts due to oilspills. Reduction of oilspill impacts can also be achieved by Stipulation 2 (Transportation of Hydrocarbon Products across the proposed lease area, sec. II.B.1.c.). Historically, much less oil has been spilled from pipelines; .0017 percent of the oil transported by pipelines has been spilled as opposed to .016 percent from tankers (Council on Environmental Quality, 1974). Thus, much additional environmental protection to vulnerable coastal habitats could probably be gained by using pipelines in lower Cook Inlet and Shelikof Strait. The unavoidable impacts to the coastal habitats are potentially very minor.

b. Impacts on Commercial and Sportfish: This topic has been identified during scoping as a major issue.

Impact of OCS Drilling Muds and Formation Water Disturbances: This subsection identifies the acute and chronic effects of OCS drilling fluids and formation water discharges upon important fisheries and benthic communities. The chronic

effects discussion encompasses marine biota generally. Refer to section IV.A.2.o. for an evaluation of impacts of OCS discharges on water quality.

Acute Effects of Drilling Muds: In spite of the variability among experimental techniques, the majority of data indicate that both whole muds and mud components, with the exception of bacteriocides, are relatively nontoxic. LD50's for the whole muds fall in range of 3,000 to greater than 100,000 ppm (Ray, 1978; McAuliffe and Palmer, 1976). Available toxicity data indicate that adult cold water organisms are generally not more sensitive than temperate water ones.

Important Alaskan commercial species which have been subject to toxicity bioassays include coho, pink, and chum salmon (B.C. Research, 1976) and pink, hump, and coon striped shrimp (Dames and Moore, 1978). The salmonids showed an LD50 ranging from 4,000 to 190,000 ppm depending upon the drilling mud components tested. The shrimp species showed an LD50 in the range of 14,000 ppm. Other cold water species tested for LD50 in the lower Cook Inlet COST well study include amphipods (500+ ppm), mysids (1,600 ppm), isopods (2,000 ppm), and brine shrimp larvae (500 ppm) (Dames and Moore, 1978).

Larval stages of commercially important crustacea indigenous to Alaskan shelf waters have not been subject to toxicity bioassays. These include tanner, king and Dungeness crab, razor clams, scallops, and mussels (NOAA, 1979). The acute toxicity levels of larval stages of crustacea can be at least an order of magnitude less (10^{-1}), if not lower, than adult stages of the same species.

Bacteriocides within drilling fluids can be acutely toxic to tested biota. Specifically, halogenated phenols, quatenary amines, and diomine salts have LD50 values of less than 1.0 ppm. The aldehydes, for example formaldehyde, are generally less toxic with an LD50 between 50 and 400 ppm (Robichaux, 1975). The U.S. Geological Survey has issued a rule prohibiting use of halogenated phenols as a drilling fluid constituent (30 CFR 250.11, 250.43; 44 FR 39031). Abundant evidence indicates that lethal concentrations (greater than LD50) of the dissolved fraction of drilling fluid contaminants are only present within a few meters of the discharge pipe.

The acute effects of the sedimentary fraction of drilling muds and cuttings upon benthic communities restricted to a smothering pheonomena where the rate of deposition exceeds approximately 5 centimeters on the sea floor (Dames and Moore, 1978).

Acute Effects of Petroleum Hydrocarbons: Acute toxicity tests have been performed on a variety of salmonoids, shrimp, crab, bottomfish, mollusks, and finfish (Trasky, 1978; Malins, 1977; Caldwell, Caldarone, and Mallon in Wolfe 1977; Katz, 1973; Mc Auliffe, 1966; Anderson et. al. 1974). The tests have been performed on both warm and cold water environments with some tests having been performed on indigenous cold water species of Alaska. Standard 96-hour bioassay results on pink scallops were 0.8 ppm, on pink salmon fry 2.9 ppm, and on adult king crabs 4 ppm (Rice et. al. 1976). The most sensitive bioassay results were reported on Dungeness crab larvae at 0.04 ppm, with threshhold toxicity effects measured at 49 ppb (Caldwell, Calderone, and Mallon, 1977). The bioassays used water soluable fractions or crude oil mechanical solutions as the test substance (Cook Inlet crude oil).

Comparison of the above toxic concentrations of the water soluable fractions (WSF) of crude oil with known concentrations of dissolved petroleum hydrocarbons in produced water discharges is difficult. The difficulty turns on the definition of the WSF and the analytical testing procedure employed. The sum of the aromatic hydrocarbons tested in the Granite Point and Trading Bay production facilities constitutes most of the WSF set of toxic hydrocarbons identified by the National Marine Fisheries Service (NMFS) (Alaska Department of Environmental Conservation, 1978). The Marathon NPDEFS Permit Application for the Trading Bay facility tested for aromatic hydrocarbons according to the Alaska Department of Environmental Conservation and the NMFS analytical procedures which permit an estimation of total WSF and a comparison with toxicity study results. The total WSF concentrations from these facility discharges (2.6-6.7 ppm) are approximately 10^2-10^3 greater than the most sensitive toxicity test results (0.04 ppm for Dungeness crab larvae).

Hence, discharges of treated produced waters from OCS platforms can be expected to be lethal to indigenous finfish and benthic species which are situated close to the source of discharge. The distance or radius of lethal effect is not known without site-specific dispersion and transport monitoring, as well as in situ bioassays. It can be conservatively estimated that lethal effects would not extend beyond 100 meters from a produced water discharge source based upon the dilution rates reported in the lower Cook Inlet rig monitoring studies.

Chronic Effects: At least three levels of effects upon marine biota can be postulated for suspected contaminants: 1) short term lethal effects, 2) sublethal physiological effects, and 3) behaviorial effects (Percy and Mullin, 1975; Trasky, 1977). There is a substantial dispute among investigators as to whether wastewater discharges from OCS operations pose chronic adverse effects through the stages of sublethal, physiological, and behaviorial effects.

Representatives of the oil and gas industry argue that sufficient research has been done to demonstrate findings of no chronic adverse effects from drilling fluid discharges upon pelagic communities (Ray, 1978; American Petroleum Institute, 1979). Various scientists and resource agency officials disagree and argue that the available evidence is inadequate to demonstrate the finding of no chronic effects (Wennekens, 1975; Wright, 1975; NOAA, 1979; Richards, 1979; Reisch and Carr, 1978).

A symposium on the environmental fate and effects of drilling fluids and cutting was recently held to report new research and synthesize knowledge (American Petroleum Institute, in press). The symposium did not unequivocably demonstrate chronic effects of drilling effluents and cutting discharges. The symposium did not provide any demonstration of long-term effects (e.g., 15-20 years) of muds and cuttings on the marine environment. Due to the multiplicity and complexity of variables in the marine environment, of which only a few can be incorporated into a single experimental design, the determination of chronic effects from muds and cuttings discharges will probably remain a question for some time.

Table IV.A.2.b.-1 gives a summary of finfish and shellfish species, habitat, season of occurrence, and the potential interaction of oil with these items. For more detailed information regarding these interactions, refer to ADF&G (1978), Malins (1977), and USDI (1976).

Table IV.A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
ADULTS					
Sockeye	Congregate in Estuaries	Nearshore; Anadromous Streams with Lakes; Karluk, Red, and Frazer Rivers (westside Kodiak)	Mid-May to Early July	Spawning migration	Behavioral; Block access to spawning streams
Pink	Congregate in Estuaries	Nearshore; Anadromous Streams; Intertidal; Most streams around Kodiak	July to Mid-August even years	Spawning; spawning migration	Behavioral; Block access to spawning areas; Toxic to spawn
Chum	Congregate in Estuaries	Nearshore; Anadromous Streams; Intertidal; West and Southeast sides of Kodiak	Late July to Late October	Spawning; spawning migration	Behavioral; Block access to spawning areas; Toxic to spawn
Coho	Congregate in Estuaries	Nearshore; Anadromous Streams; Northeast and Southwest corners of Kodiak Island	July to Late November	Spawning migration	Behavioral; Block access to spawning areas
	Pelagic, Surface	Throughout the Gulf of Alaska	Winter, Spring	Feeding	Deplete food source; Behavioral; Ingestion
Chinook	Congregate in Estuaries	Nearshore; Anadromous Streams; West-side Kodiak Island	Mid-June to Late August	Spawning migration	Behavioral; Block access to spawning streams
	Pelagic	Surface; Large Bays and open ocean	Winter, Spring	Feeding	Deplete food source; Behavioral; Ingestion
Steelhead	Congregate in Estuaries	Nearshore; Anadromous Streams;	Spring and Fall	Spawning migration	Behavioral; Block access to spawning stream
	Estuaries	Nearshore	Fall and Early Winter	Feeding; overwintering	Additional stress on spent spawners; Ingestion

Table IV.A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions--continued

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
Dolly Varden	Congregate in Estuaries	Nearshore; All Anadromous Streams	Late June to October and Early Winter	Spawning migration	Behavioral; Block access to spawning streams
JUVENILES Sockeye	Enter Estuary after 1-3 years in fresh water lakes	Nearshore; Surface;	May to August	Smolting; Feeding	Toxicity; Reduced food supply; Behavioral; Ingestion
	Seaward Migration	South and west along the Continental Shelf; Surface	August to October	Outmigration; Feeding	Toxicity, Behavioral; Ingestion
Pink	Enter Estuary	Nearshore; Surface	October to November	Smolting; Feeding	Toxicity, Reduced Food supply; Behavioral; Ingestion
	Seaward Migration	South and west along the Continental Shelf; Surface	October to November	Outmigration; Feeding	Toxicity; Behavioral; Ingestion
Chum	Enter Estuary	Nearshore; Surface	March to June	Smolting; Feeding	Toxicity; Reduced food supply; Behavioral; Ingestion
	Seaward Migragration	South and west along the Continental Shelf; Surface	Mid-August to Late Fall	Outmigration; Feeding	Toxicity; Behavioral; Ingestion
Coho	Enter Estuary	Nearshore; Surface	March to July	Smolting; Feeding	Reduced food supply; Behavioral; Ingestion
	Seaward Migration	South and west along the Continental Shelf; Surface	Late Summer to Early Winter	Outmigration; Feeding	Behavioral; Ingestion

Table IV.A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions--continued

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
Chinook	Enter Estuary	Nearshore; Surface	June to Late August	Smolting; Feeding	Reduced food supply; Behavioral; Ingestion
	Seaward Migration	South and west along the Continental Shelf; Surface	Fall to Early Winter	Outmigration; Feeding	Behavioral; Ingestion
Steelhead	Enter Estuary	Nearshore; Surface	Early June to Mid-July	Smolting; Feeding	Reduced food supply; Behavioral; Ingestion
	Seaward Migration	South and west along the Continental Shelf; Surface	Unknown	Outmigration; Feeding	Behavioral; Ingestion
Dolly Varden	Enter Estuary	Nearshore; Surface	Early April to Late June; September to October	Smolting; Seeking overwintering streams; Feeding	Toxicity, Reduced food supply; Behavioral; Block access to overwintering streams; Ingestion
EGGS AND HATCHING					
Pink	Intertidal	East and West Sides of Shelikof Strait and lower Cook Inlet	Late July to May	Incubation; Hatching; Emergence	Smothering; Toxicity
Chum	Intertidal	Same as Pink	Late July to May	Incubation; Hatching; Emergence	Smothering; Toxicity
ADULTS					
Herring	Rocky Beach	Intertidal; Shallow Subtidal Same as Pink Salmon	Mid-May to Mid-June	Spawning	Inhibit spawning; Toxic to spawn

Table IV\A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions--continued

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
	Benthic Overwintering	Near Bottom; approx. 50 fathoms Westside of Kodiak Island	Late Fall through Winter	Overwintering; No feeding	Behavioral
EGGS AND LARVAE Herring	Rocky Beach	Nursery Intertidal; Shallow Subtidal; Bay Areas	May to June	Incubation; Hatching	Toxicity; Smothering Reduced hatch
	Nearshore	Nursery Intertidal; Shallow Subtidal	May to Late Fall	Feeding	Reduced food supply; Toxicity; Ingestion
JUVENILES Herring	Nearshore	Surface; Bays and Inlets	Late Fall, Winter, Spring,	Feeding	Reduced food supply; Behavior; Toxicity; Ingestion
ADULTS Sablefish	Demersal	OCS deeper than 200 meters	Year-round	Feeding	Reduced food supply; Behavior; Toxicity; Ingestion
EGGS THROUGH LARVAE Sablefish	Pelagic	Surface of Shelikof Strait and lower Cook Inlet possibly	Early Spring to Late May	Incubation; Hatching; Feeding	Toxicity; Reduced food supply; Ingestion
EGGS Pacific Sandlance	Demersal	Sandy Bottom; Nearshore; 25-100 m water depths	Winter	Spawning; Incubation	Toxicity; Behavioral

Table IV.A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions--continued

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
JUVENILE					
Pacific Sandlance	Demersal	Sandy Bottom; Offshore	Summer to Early Fall	Feeding	Toxicity; Behavioral; Reduced food supply; Ingestion
Adult Walleye Pollock	Pelagic	OCS between 100 and 200 meters	Late Summer	Feeding	Ingestion
Eggs & Juvenile Walleye Pollock	Pelagic	Inshore, bays, southeast Trinity Isle., Kiliuda Borough	March to June	Maturation	Toxicity, reduced food
Atka Mackerel	Demersal	10-20 m depths nearshore; Rocky swift current areas	Summer	Spawning	Toxicity; smothering spawn
ADULTS					
Pacific Cod	Demersal	Inshore embankments to; Intertidal	December to March	Spawning	Toxic to spawn; Inhibit spawning
LARVAE					
Pacific Cod	Demersal	Rocky; Shallow Subtidal; Intertidal	January to Late June	Feeding	Toxicity; Reduced food supply; Ingestion
Pacific Ocean Perch	Demersal	Shelf break and slope; 200-meter depths	Year-round	Spawning; Maturation; Feeding	Possible ingestion
Other rockfish	Demersal	Shelf break and slope;	Year-round	Spawning; Maturation; Feeding	Possible ingestion

Table IV.A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions--continued

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
ADULTS English Sole	Demersal	Nearshore	Winter, Summer	Spawning Feeding	Toxic to spawn; Behavioral
EGGS AND LARVAE English Sole	Pelagic	Surface; Nearshore	Winter; Spring	Incubation; Feeding	Toxicity; Reduced food supply; Ingestion
ADULTS Petrale Sole	Demersal	Deep water areas		Feeding	Ingestion
ADULTS Dover Sole	Demersal	Deep water areas	Spring, Summer	Feeding	Ingestion
ADULTS Starry Flounder	Demersal	Nearshore	Winter; Summer	Spawning Feeding	Toxic to spawn; Behavioral, reduced food supply
EGGS AND LARVAE Starry Flounder	Pelagic	Near surface	Winter, Spring Summer	Incubation; Feeding	Toxicity; reduced food supply; Ingestion

Table IV.A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions--continued

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
ADULTS Pacific Halibut	Demersal	Near bottom; Near 200 m isobath; lower Cook Inlet	Winter	Spawning	Toxic to spawn; Behavioral
EGGS & LARVAE Pacific Halibut	Pelagic	Surface to 200-meters lower Cook Inlet	Spring, Summer	Incubation; Feeding	Toxicity reduced
ADULTS Capelin	Pelagic	Nearshore; Near Surface; Pebbly beaches.	May to June	Spawning	Toxicity; Toxic to spawn; Behavioral
ADULTS King Crab	Deep water; Come into shallow water to spawn	Kachemak Bay, Bays, east side of Shelikof Strait.	June to August	Feeding; Spawning depth	Low probability because of water
JUVENILES King Crab	Shallow water to 100 m	Lower Cook Inlet, Shelikof Strait. Bays and Inlets.	Year-round	Feeding; Rearing	High potential for adverse effects
LARVAE King Crab	Semipelagic to benthic in shallow water	Bays, Inlets, especially Kachemak Bay	Semipelagic March-July	Feeding; Rearing	Toxicity to larvae high

Table IV.A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions--continued

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
ADULTS Tanner Crab	Deep water to 50 m when spawning	Bays and Inlets, especially Kachemak Bay.	January-May in shallow water	Feeding; Spawning	Low probability because of water depth
LARVAE Tanner Crab	Semipelagic to benthic in shallow water	Bays and Inlets, especially Kachemak Bay.	Semi-pelagic March	Feeding; Rearing	Toxicity to larvae high
ADULTS Dungeness Crab	To tide line; during spawning;	Bays and Inlets; east-west sides of Shelikof Strait and Kachemak Bay.	Spawn October-December	Feeding; Spawning	Medium probability summer; Low in winter
LARVAE Dungeness Crab	Semipelagic to benthic in shallow water	Bays and Inlets; east-west sides of Shelikof Strait and Kachemak Bay.	Semi-pelagic June-December	Feeding; Rearing	Toxicity to larvae high
ADULTS Shrimp	Deep water (days) To surface (nights) Spawn in bays and around islands	Bays and Inlets east and west of Shelikof Strait and Kachemak Bay.	Year round spawn; Spawn August-September	Feeding; Spawning	Can affect eggs (carried on females) and food
LARVAE Shrimp	Semipelagic to benthic in shallow water	Bays and Inlets east and west of Shelikof Strait and Kachemak Bay.	February-July	Feeding; Rearing	Toxicity to larvae larvae high

Table IV.A.2.b.-1
Fish Species, Habitat Use, and Potential Oil Interactions--continued

Species of Biota Group	Principal Habitat	Areas of Peak Occurrence	Season of Peak Occurrence	Area Use by Biotic Group	Potential Oil Biota Interaction
ADULTS					
Scallop	60-180 meter depths; Benthic	Not in proposed sale area	Year-round	Feeding; Spawning	Low probability because of depth
LARVAE					
Scallop	Planktonic near surface	Not in proposed sale area.	June to July	Feeding; Rearing	Toxicity to larvae high

Source: U.S. Dept. of Commerce, 1978; State of Alaska (ADF&G, 1978).

Salmon, herring, steelhead trout, and other pelagic (free swimming) and demersal (bottom dwelling) finfish species, such as halibut and walleye pollock, are found throughout the Shelikof Strait and lower Cook Inlet areas. These finfish have been divided into groups for describing impacts.

Impact on Demersal Species

Pacific halibut and other flatfish are ocean bottom dwellers that have free-floating eggs and larvae. A few months (1-3) after fertilization, the eggs become buoyant and generally float at or near the surface for 1 to 3 months. After the eggs hatch, the larval fish remain in the surface waters until metamorphosis when the young fish return to the ocean bottom where they feed and grow to maturity. It is during this free-floating period that these types of fish are most vulnerable to pollution events on and in the water. In addition to eggs from the Kodiak offshore areas, eggs from the western and northern Gulf of Alaska drift to the west and settle out near Kodiak.

Between November and March, halibut spawn at depths between 180 and 450 meters (590 and 1,476 ft). The majority of the commercial catch is in nearshore waters between 60 and 140 meters (197 and 459 ft) during May through August.

No definitive studies have been conducted on the effects of Alaskan oil on the eggs or larvae of these species. However, several past studies on similar species (James, 1926; Kuhnhold, 1970; Wilson, 1970) have indicated lethal results. While in the surface waters, the egg and larval forms are the most susceptible life stages. It would, therefore, be reasonable to assume that, should a chronic or massive hydrocarbon spill occur during these critical life stages, the population of eggs and/or larvae would be reduced. There is presently no way to quantify the extent of such an impact.

Information contained in the oilspill risk analysis (sec. IV.A.1.d. and appendix D) indicates that the areas containing high populations of halibut along the northeast shore of Kodiak Island have a high probability of being impacted by a pollutant event because of this proposal. The areas from Uganik Bay to Malina Bay are especially vulnerable to pollutant events. This is about one-fifth of the area with high halibut population within the proposal. What effect a pollutant event would have on the halibut population is unknown at this time. The many natural variables and the effect of commercial fishing on this species could mask any population change caused by the proposal.

Groundfish species such as walleye pollock, Pacific cod, black cod, Pacific Ocean perch, and flatfish are all demersal forms living in deep water. The eggs and/or larval stages of these fish are free floating and are vulnerable to oil contamination for a period after the adults spawn. Should the juvenile portion of the population be killed by a massive event, the entire population would be affected. The biological impact relates to the severity of any oil pollution event and depends upon a multitude of factors which cannot be quantified. Decline or elimination of a year class could have major economic effects in subsequent years, as well as, probable significant biological effects on the population.

Walleye pollock and Pacific cod are known to be present in large numbers in Shelikof Strait. Impacts based on four possible major oilspills because of the proposal could lower the populations of these species if they were to occur during the time the larvae are present in the upper part of the water

column. The effect may not be apparent for several years (when the adults enter the fishery) and may not be directly attributable to a pollutant event. These effects cannot be quantified, but because of the high number of probable events, there would probably be some reduction of the bottomfish species for 1- or 2-year classes.

In Shelikof Strait and Cook Inlet, herring move inshore to spawn generally from May through mid-June; however, the peak of spawning varies greatly from year to year. Herring generally spawn on or near living plants such as eelgrass, kelp, or other algae, and rocky substrates where they broadcast their adhesive eggs.

Hatching time varies with temperature, but averages 15 days from spawning to hatching. The larvae are very delicate and subject to environmental influences (Smith, 1976). Young herring collect in small schools and gradually move seaward toward the mouths of bays or inlets where they grow rapidly and consolidate into large schools. These schools move into deep water by late fall. It is possible that these fish move into the proposed sale area. While offshore, they spend much of their time at or near the the water surface.

A pollutant on the water and the beach could select against the highest quality eggs, and would increase mortality of all eggs. A massive hydrocarbon spill or chronic pollution during the 3- to 4-week reproductive period could have a significant impact on adult, egg, and larval mortality. Natural prehatching mortality varies from about 60 to 90 percent, and larval mortality is thought to be as much as 99 percent (Smith, 1976). Any additional stress on this life stage could adversely affect whole year classes with subsequent decline of commercial stocks in the adult year periods.

Probable impacts based on information contained in the oilspill risk analysis could be moderate because areas of high use by herring are not in the high probability of impact zone. There may be some reduction of local populations but these cannot be quantified at this time.

In most finfish populations, the adults would be less affected than larval and juvenile forms. Those fish species, groundfish, halibut, etc., whose larvae and juvenile life stages live in the upper surface of the water column and within 10 days of a possible spill point (leased tracts) would be most vulnerable. The oilspill trajectory model indicates that virtually all of the salt water fish habitats in or adjacent to the proposed lease area would be affected (sec. IV.A.1.d. and appendix D).

The extent of the impact resulting from an oilspill would depend upon the magnitude of the spill, the trajectory a spill would take, and the length of time it is in a particular habitat.

Conclusion: There is a possibility that groundfish, halibut, and other populations in the Shelikof Strait may be reduced by some unquantifiable amount during the life of this proposal. Adverse events (major spills) would probably occur four times during the life of the project (appendix D). If they occurred when the larvae of these species were not present (about 6 months of the year), no effects would likely be attributable to oil and/or gas production. If the larvae were present during an oilspill event, only those that actually came in contact with an oil slick or the water soluble fractions of oil around

or below the slick would be adversely affected. Because of the number of predicted spills, the probability of a spill affecting these species is high. Bottomfish species, except halibut, may be more adversely affected by this proposal than the other species discussed above because of their wide spread distribution in Shelikof Strait and their presence in the high probability of risk area.

Cumulative Effects: Adverse effects from oil and gas activities in Cook Inlet could affect these species populations over time should these activities put hydrocarbons into the water.

The number of pollution events in Cook Inlet will probably increase if increased oil and gas development occurs. Chronic pollution events which impinge on certain localized areas (as yet unidentifiable) will also put more oil and related pollutants in the water. The impacts mentioned above would, in many cases, be enlarged especially if pollutants come in contact with larval or young, or affect food sources. These impacts cannot be quantified at this time. For those species that are commercially fished, quantification of impacts may be impossible at any time because of the masking effect of the fishery. However, the level of activity in the relatively confined area makes the probability of adverse effects high with a resultant loss of population at some time during the life of the field.

Unavoidable Adverse Effects: There would probably be unavoidable fish population reductions. Chronic pollution and/or habitat alteration could also affect populations, probably for the life of the project and the recovery period afterwards.

Impact on Salmon Species

Because of their dependence on inshore areas for migration routes, spawning, larval survival, and juvenile feeding, salmon may be the most vulnerable commercial species in the area to be affected by this proposal.

Cook Inlet/Shelikof Strait is surrounded by spawning rivers and intertidal spawning areas that rear and support these fish populations. The life cycle of these populations and consequently the resource itself is heavily dependent upon these spawning and rearing waters.

Salmon adults occur in these waters from May to September annually. Salmon larvae and fry occur in the tidal zone waters and rivers from early May to early September annually. Thus populations of adults and young would be subject to repeated exposure for long periods over the 26 years of oil production expected from the area.

Due to the constrained nature of the ecosystem in the inlet and the strait, the relatively short period spills would take to reach shore impact areas (1-10 days), and the biologically critical nature of the spawning and rearing areas that would be reached, it appears likely that oilspills would adversely affect salmon population levels during the life of the producing field. Any catastrophic event, such as a tanker collision, major pipeline rupture, or well blowout could seriously deplete some local salmon populations for 1 to several years. It is not likely that the effect would be as much as 25 percent or greater of the inlet/strait salmon population due to the selective

impact areas under tidal and wind influences for any single event. Pink salmon populations that use the area from Uganik Bay to Malina Bay and those that spawn in Kamishak Bay would be more adversely affected than the populations using the rest of the area.

The sublethal effects from oil pollution, especially from the chronic low-level discharge of oil into the marine environment, are little known and potentially very dangerous to fish. Feeding, reproduction, and social behavior in fish have been disrupted by soluble aromatic derivatives as low as 10 to 100 parts per billion (Todd et al., 1972; Sondheimer and Simeone, 1970). Interference with predator detection of prey is also possible (Whittle and Blumer, 1970). This low-level interference could also disrupt migratory and homing detection (Nelson-Smith, 1973).

The salmon fishery is one of the most important in the proposed sale area and is concentrated near shore and in the numerous bays and fiords. Recreational fishing is concentrated on the numerous anadromous fish streams. Chronic oil pollution sources near major anadromous spawning streams or within anadromous migration paths could elimiate certain runs. Because of the long time pink salmon spend in shallow salt water this species would be particularly affected by oil on the water.

A series of bioassays with "whole" oil solutions in fresh and saltwater were conducted by Rice (1973) to determine sensitivity differences in the development stages of pink salmon. He found eggs the most resistant stage, with no immediate deaths observed at doses of 3.2 ml oil/liter water (25 ppm). Alevins (newly hatched salmon) were increasingly sensitive, reaching their peak of sensitivity (0.4 ml/l) at completion of yolk absorption. Fry were more sensitive to oil in seawater (0.04 ml/l) than in freshwater (0.4 ml/l). These values are at the 96 hour median tolerance level.

Rice concluded that salmon are most vulnerable when emerging from the gravel bottoms of streams during spring; sublethal effects, even if physiologically reversible, may reduce survival of young salmon as they emerge and enter the sea.

In all major spills, fish larvae and fry in upper layers of inshore waters would be most severely affected because of their dense concentrations. Not only would these larvae be exposed to direct kill from water soluble fractions of petroleum hydrocarbons, they would also be most vulnerable to death from starvation if their food supply of phytoplankton and zooplankton were killed by a massive spill (Hunter, 1972). Maximum damage from this impact would occur in the spring and early summer. This is the peak anadromous species out migration period. At this time fry of anadromous species are concentrated in the inshore shallows and would be extremely vulnerable to oil covered water. This is also the time when larval forms of other fish species are in the upper layers of the water column and vulnerable to pollutants.

There may be only a short, 2-week to 1-month, period of the year when pink salmon are not in the intertidal area. If oil or other pollutants come ashore at that time (June) there may be little or no effect on the population. If, however, a pollutant reaches shore during the time of fry emergence, an entire area year class may be destroyed, and because pink salmon have alternate year high spawning populations this could reduce populations far into the future if

it happened during the high year. The severity of adverse impact would vary by time of year the event occurs, the length of time the oil is on the water before reaching shore, the amount of oil and other factors discussed above.

In summary, oil development and production activities could adversely affect populations of salmon species that live all or any part of their lives in the area. It can be speculated that adult salmon species would be less affected than juvenile and larval forms. The primary impact would be on egg, larval, and fry stages of the fishery resource. Salmon fry, especially pink salmon, remain in estuarine areas surrounding the proposed sale area for several months, and would be especially vulnerable to hydrocarbon spills that reached the shore.

The reduction or loss of a year class along part of the coast would be especially serious if it affected pink salmon which have naturally alternating strong and weak year classes (due to poor littoral food supply, abundance of predators, or some other natural biophysical factor).

Even low, sublethal concentrations of hydrocarbons cause stress to pink and chinook salmon, as shown by increased respiration rates and by behavioral avoidance (Brockson and Bailey, 1978; Thomas and Rice, 1975; Rice, et al., 1976). This effect is probably true in the other untested species of salmon. This means that salmon may avoid inshore waters which are contaminated with oil or other liquid hydrocarbons. The inshore areas are also the locations in which salmon are harvested.

Conclusion: Pink salmon populations would be more susceptible to adverse effects from this proposal than the other species. A pollutant event caused by this proposal could adversely affect a year class or more of fry as well as a year class or more of adults.

Some population reduction could be expected near the pipeline landfall and the tanker loading area. It is estimated that this reduction would be short lived, possibly only through the construction stage and the population recovery time (2-4 years). Quantification of salmon population loss cannot be made at this time. However, those streams on the west side of Kodiak Island, particularly between Uganik and Malina Bay (areas at high risk from oilspills, see sec. IV.A.1.d.), could lose entire year classes.

Cumulative Effects: There are major pink salmon streams on the west side of Kodiak Island. Development in the Shelikof Strait and Cook Inlet could further reduce stocks of pink salmon. The major spawning streams for sockeye salmon are on the west side of Kodiak Island and development there could cause population reduction of the species. Amount of loss and recovery time cannot be quantified at this time; however, loss could be expected to be major locally, but short lived (5 years).

Overall, the salmon resource in Cook Inlet could be adversely affected by oil development. Although the impact cannot be well quantified it would be marginal only if controls are rigorous and accidents average. The significant effect to the resource would occur if any single event or closely spaced multiple pollution events detered or destroyed a breeding population or area, or fry rearing areas over a wide range. A major setback of the resource (i.e. 10-20 percent or 2-4 spawning seasons) could result. Recovery would be slow and difficult if coupled with exposure to chronic pollution events.

Unavoidable Adverse Effects: There may be a lowering of salmon populations from selected streams on the west side Kodiak area because of this proposal.

Crab Species

The three major species of crab (king, tanner, and Dungeness) have similar life histories in that the adults spend the winter months in deep (150-450 m (492-1,476 ft)) oceanic waters, and migrate to shallow (6-20 m (20-66 ft)) water in the spring or early summer. The eggs, which have been carried by the female for about a year from the previous year's spawning activities hatch and the young spend from 1 to 4 months (March-June) as free swimming planktonic larvae. After the larval stage, the juveniles assume the adult form, settle to the bottom, and spend from 1 to 5 years in shallow bays and estuarine areas before joining the adults on their migrations.

The larval forms are more susceptible to floating hydrocarbons; the juveniles are somewhat susceptible to both floating and sinking hydrocarbons. The adults would be affected by the oil that sinks to the bottom. All age groups would be affected by the reduction of food species. In the event of a large pollutant event, the young could be killed and thus reduce the potential adult population. If these hydrocarbons settle to the bottom, the adults may also be killed, further reducing the population. Population reductions would affect the fishery. Crabs could be flavor tainted by contact with hydrocarbons and other pollutants, thus reducing their value.

Exposure to chronic pollution associated with oil/gas development and production could affect the larval and juvenile life stages of crab and other shellfish species. King and Dungeness crabs spend lengthy periods in shallow water; tanner crabs spend some time in shallow water. Effects of chronic exposure are as yet unknown, but could range from impairment of development through direct reaction on the animal or because food species are killed, to "ecological death" caused by direct interference with development from the exposure.

Studies by Rice and others (1976) tested Cook Inlet and other oils against a number of oceanic organisms, including larval tanner and Dungeness crab and juvenile king crab. They found that juvenile king crab quickly accumulated methylnapthalene and other aromatic compounds of oil in their body tissue and were able to quickly cleanse themselves after removal from from the contaminated water to clean water. They also found that at concentrations of oil equal to or just below the 96-hour TLm (medium tolerance limit) juvenile king crab respiration rates were depressed indicating stress. Measurement of metabolism, however, does not appear to be a sensitive indicator of oil toxicity to crabs. Larval forms of tanner and Dungeness crab in these studies exhibited relatively high (10.8 and 7.1 ppm of oil, respectively) TLm to Cook Inlet oil. The median effective concentration (ECm) or the amount of oil it takes to induce moribundity in larvae, however, was approximately 2 ppm for both species. Larvae can exist in the moribund stage several days before dying. Larvae do not recover from this stage.

One of the conclusions of the study was that of the forms studied, larvae were the most vulnerable to oil of the life stages tested in this program. They were quantitatively more sensitive to oil toxicity, especially during molting. Crustacean larvae may be particularly susceptible to oil toxicity compared with adults because of their molting frequency.

Studies have shown that in the larval stage these species are very vulnerable to adverse effects caused by the water soluble fraction of oil. Because the water soluble fraction of petroleum products is quite voluble, it dissipates into the air over a relatively short period, depending on sea state, temperature, and type of product. The younger the product when it contacts an organism, however, usually the more damage can be done to the population.

Individual organisms subjected to sublethal exposures may undergo "ecological death" if they are incapable of adjusting to natural stresses in their environments because of this exposure. For example, postmolt tanner crab during bioassay testing lost as many as seven legs, including both chelae, during short exposures to crude oil (Karinen and Rice, 1974). Even though the crabs lived through the exposure, they would not have survived in the natural environment.

Chronic exposure may adversely affect a specific portion of the population if the adults' ability to reproduce is seriously impaired. Physiological changes, such as reduced fecundity and delayed ovary development, or impaired behavioral mechanisms preventing location and identification of mate or timing of spawning can impair reproduction. Thus, although chronic exposure might not directly kill the adult, it could induce a trend of decreasing numbers that eventually could eliminate a specific portion of the population using the polluted habitat. Lack of information regarding land based development sites and critical reproduction areas precludes quantifying these effects.

Some fractions of oil may sink to the bottom (Friede, et al., 1972), where they remain for some time and could taint shellfish. Instances have been cited where shellfish were tainted and their marketability was reduced by exposure to even slight amounts of oil (Blumer et al. 1970; Wilber, 1969).

Conclusion: There is a possibility that populations of king, tanner, and Dungeness crab could be reduced by activities associated with oil and gas production in the proposed lease area. Egg and larval forms are most susceptible to adverse impacts from pollutant events associated with the project. Extent of impact would vary by time of year, amount and kind of event, and the area in which the event takes place.

The amount of population reduction cannot be estimated. Chronic pollution events covering egg release and larval rearing areas could reduce the populations of these areas substantially. The results of population reduction could show up in the commercial catch. However, because there is commercial harvest of these species, assessment of cause of population reduction would be difficult.

Additional impacts caused by oil and/or gas development in Cook Inlet would have moderate local effects on the crab populations. A major spill from a tanker carrying oil from Cook Inlet in an area of high crab larvae populations is also a possibility. If such an event were to occur, larvae crab populations in the area could be severely reduced.

The relatively confined area of the proposed lease area and the possibility of four major pollutant events over the life of the project indicates that there would probably be a reduction of crab populations caused by the events associated with the proposal. These may be local (individual bay/nursery areas)

or wide spread (larval drift areas) but would probably cause some unquantifiable reduction of crab populations. Those crab populations using the area between Uganik and Malina Bays have a higher probability of adverse effects than populations using other areas because the area between these two bays is considered one of high risk from oilspills (see sec. IV.A.1.d.).

Cumulative Effects: There could be a larger decrease in the crab populations because of additive pollutant events from these projects (described in sec. IV.A.1.h).

Egg and larval forms would probably receive the brunt of the impacts; however, should food sources become contaminated or reduced, the adult population would be directly affected. There is no way to quantify these effects. Even determination of the cause of population decrease would be difficult because of the commercial fishery on these resources. In the Shelikof Strait area, impacts would be localized and moderate to severe.

Unavoidable Adverse Effects: Effects of this proposal on the shellfish species of the area would be a reduction of population in two ways. A portion of one or more year class would probably be eliminated because of one or more major spills, and chronic low-level pollution could alter a portion of the habitat to make it unsuitable for these species. Both effects are unquantifiable at this time.

Impact on Shrimp Species

The shrimp fishery is composed of five species of Pandalid shrimp: the pink, humpy, coonstripe, sidestripe, and spot. Approximately 97 percent of the catch is pinks. Mating occurs in September in coastal shallows with the eggs carried offshore by the females until they hatch the following March and April. Young shrimp are found primarily in shallow water in bays and move into deeper water as they grow. Shrimp inhabiting shallow water are the most susceptible to oil pollution. Sex transformation occurs over several molt stages in March or April. It is during these molt periods adult shrimp are most susceptible to pollution effects (Rice, et al., 1976). Adults undergo daily vertical migrations and are in the upper waters at night where they would be most vulnerable to contact with hydrocarbons.

Of the four species of shrimp considered in a past study (USDI, 1976), pink shrimp was the least resistant to water soluble fractions of crude oil. Shrimp larvae are apparently more sensitive to hydrocarbon toxicity at the time of molting, and later larval stages suffer a higher mortality rate than early larval stages.

Pink shrimp did not accumulate paraffin components of oil to any great extent; however, they continued to accumulate naphthalenes at decreasing rates throughout the entire exposure period and did not readily depurate the accumulated naphthalenes which may indicate a buildup in the food web (Rice, et al., 1976).

Larvae of spot shrimp appear to be much more sensitive to naphthalenes than previously demonstrated. Concentrations as low as 8 ppb (parts per billion) cause narcosis (sleep or inactivity) followed by death in 1 or 2 days. In addition, shrimp larvae concentrate naphthalene and a naphthalene-protein

complex 25 to 100 times the exposure levels, leading to the conclusion that ". . . aromatic hydrocarbons acquired in food may be metabolized quite differently from such compounds acquired from other routes . . ." (Sanborn and Malins, 1976). These results indicate previous "static" bioassay techniques may not adequately assess the toxicity of water soluble hydrocarbon fractions to populations or ecosystems and potential exists for impacts at higher trophic levels.

The fact that shrimp concentrate certain water soluble fractions of crude oil and do not readily depurate these substances could mean that entire populations could be tainted by oil. This would adversely affect their marketability.

Conclusion: Effects on shrimp cannot be quantified, but enough information exists to assume that reduction of shrimp would result from a chronic or massive pollution events. The population decline would depend on life stage affected, areal extent of the event, and length of time of occurrence. At maximum pollutant levels, a marked decrease would be possible and it should be assumed that the local shrimp stocks and fishery would decline.

Based on information contained in the oilspill risk analysis (appendix D) and catch statistics for the proposed area (sec. III.B.2.d.), about 13 percent of the shrimp population is contained in areas of high risk because of events attributable to this proposal. Quantification beyond this is not possible.

Flavor tainting of shrimp flesh would reduce the commercial fishery in these populations at least for a time. What affect this would have on the total population is unknown. Overall quantification of this assumed population reduction is not possible. It could be assumed, however, that the local shrimp stocks and commercial fishery would suffer.

Cumulative Effects: As time passes a cumulative long-term sublethal and chronic contamination of shrimp may occur as a result of this proposal, primarily in the Shelikof Strait area. However, the amount of population reduction cannot be measured.

There is a good chance that at least one pollutant event will adversely affect shrimp populations. This would affect local populations, especially between Uganik and Malina Bays, on the west side of Kodiak Island, or the widespread larval drift area off Kachemak Bay. The cumulative effects would be similar to the general effects described above, but the probability of them happening would be greater.

Unavoidable Adverse Effects: Chronic, low-level discharges of petroleum could result in a local long-term reduction of shrimp populations in the area where product treatment and shipping take place. Severity of impact depends on location of the treatment plant in relation to the shrimp.

Impact on Other Shellfish

The razor clam is the principal clam species harvested, and is presently distributed along 21 major beaches within the Shelikof Strait area (graphic 4). Of these, 14 beaches have supported commercial harvests at some time. Presently, Swikshak Beach is the only beach in the Kodiak area which has clams certified safe for human consumption (ADF&G, 1976). Recently, razor clams have been

commercially harvested from beaches near Polly Creek on the western bank of Cook Inlet. Most other clam beaches have not been checked or certified by the State.

Egg development commences in May and June. Ovulation and fertilization occur in July and August with larvae settling out of the water column in September. The duration of the mating period is approximately two tidal cycles and is highly dependent upon temperature.

Clam larvae are the most vulnerable to pollutant events in the summer and fall. Clams, by straining the surrounding water for food particles, can concentrate hydrocarbons in their tissues (Stainken, 1975). Even a slight amount of oil can taint clams (Blumer, et al. 1970, Wilber, 1969).

Chronic exposure to low concentrations of oil may be detrimental. Seawater extracts of oil have been found to have toxic effects on three survival functions in molluscs: 1) inability to attach to substrate, 2) depressed rate of shell closure resulting in greater exposure to predators, and 3) inhibition of oxygen uptake (Dunning and Major, 1974).

When clams were oiled by Prudhoe Bay crude, they showed a range of effects. Some moved from the sediments to the surface and died from the oil-contaminated sediments. Those which did not die may not have survived in nature where they would have been vulnerable to predation or adverse environmental conditions.

If a major hydrocarbon spill reaches nearshore areas in less than a day, severe damage could result from smothering or the repeated pollution of clam beds from the hydrocarbons that become mixed in the sediments. The oilspill model and persistence index (secs. IV.A.1.d. and e.) indicate that spills from the proposed lease area have an additional 15 percent likelihood of affecting commercial fishing areas for a period of about one year.

Scallops are found in Cook Inlet with the greatest numbers found between Augustine Island and the Barren Islands. They are also present on the west side of Shelikof Strait near the proposed lease area and along the east side of Shelikof Strait south of the proposed lease area. They are generally found in water depths of 30 to 70 fathoms.

Scallops mature sexually in their third year. Spawning probably begins in early June and may continue until early July. Spawning males and females release sperm and eggs into the water where fertilization occurs. The eggs settle to the bottom and adhere to the substrate. After two or three days the eggs hatch and the larvae begin a two and one-half week planktonic phase. At the end of this time the individual settles to the bottom as a juvenile.

Scallops exposed to chronic low exposure of water soluble fractions of oil show significant accumulation of paraffins and napthalenes. The napthalenes can be depurated within 120 hours (Rice, et al., 1976).

Conclusion: Razor clam beaches in Shelikof Strait have a greater probability of being affected than those along Cook Inlet by the proposal. Because of the high number of probable spills, clam populations could be reduced during the life of the project. Depending how soon oil gets to the beaches and how much is incorporated into the beach sand and mud, recovery rates may be very long (+10 years). Little is known about the effects of hydrocarbons on scallops.

Cumulative Effects: Because of the location of clam beaches on both sides of Cook Inlet and Shelikof Strait, razor clams could be affected by pollutant events. Little is known about the effects of hydrocarbons on scallops.

Unavoidable Adverse Effects: Depending on location of shoreside facilities unavoidable impacts could be short-lived (construction away from the clam beaches) or permanent (clam beaches covered by facilities). Extent of the impact cannot be estimated.

c. Impacts on Commercial Fishing: This topic has been identified as a major scoping issue. Analysis of impacts of this proposal on fish populations in section IV.A.2.b. estimated that pink salmon would be the fin fish species most adversely affected by a pollutant event. Impacts on crab and other shellfish would be expected to be local but could be long lived. Therefore, there could be an effect felt by commercial fishermen using the fish resources of the area because of population reductions on a local basis.

There is estimated to be from one to four exploratory vessels in use at any time. Exploratory activities in the United States have been extremely nonpolluting and if maritime support and supply activities are based at Nikiski, it is estimated that little, if any, effect will be felt by commercial fishermen during the exploratory phase of this proposal.

Should maritime support and supply activities come out of Homer, there could be some impacts from conflicts for maritime materials and possibly some gear loss (crab pots) unless travel routes are defined. These impacts are estimated to be minor, mitigatable, and short term.

There would, however, be several adverse impacts attributed to the proposed lease sale should production occur. These impacts would be similar in all fisheries, although different in magnitude. These impacts are loss of fishing gear, loss of fishing area, competition for labor and materials, inability to market fish because of flavor tainting, and loss of fishing time because of proposed activities.

Fishing gear has been lost during the exploratory and production phases of offshore oil and gas development. Seismic, and support and supply boats, if unregulated, have and probably would run through fishing grounds to the detriment of fishing gear. Crab pot fishermen suffer the most. Running gear can destroy the floats or move pots into water so deep the floats cannot be seen. In a town like Homer, Seldovia, or Kodiak, replacement pots (costing $500 or more) may not be available after the season starts. Shipment of pots from Seattle can take several months, at which time the crab quota may be taken or the season ended and the fishing over. The Fishermen's Contingency Fund (appendix G) provides for payment for loss of or damage to fishing gear due to OCS-related activities. It also provides for payment for loss of profits due to such gear loss. See section I.C. for further discussion of this fund.

This impact would probably not affect all the fishermen at the same time but more than one could be affected in any year. The severity of impact would depend upon when this happens during the season, how many pots are lost, and how soon replacements are made. We cannot quantify the severity of impact in dollars, but it could conceivably cause the loss of one season's profits to at least one fisherman per year.

Salmon or herring gill nets that are fouled during a pollutant event is another type of gear that could be lost because of the proposal. The chance of loss is less because of the smaller chance of spills coming to shore, the shorter timeframe that gear is in the water, the presence of the owners while they are fishing, and the areas fished. Impacts would not be as severe as with lost pots, and replacement of gear would be faster and cheaper.

Production areas including anchoring and an avoidance area would equal about 800 hectares (2,000 acres) per production rig. Four production rigs are assumed for the mean case of this proposal. Therefore, approximately 3,200 hectares (8,000 acres) of ocean bottom would be required for the production platforms needed to produce the estimated oil and gas reserves within this proposal.

Ground fish and halibut fishermen would probably be most affected by this loss of fishing habitat, but in this case the effects would be minimal. Site restriction for protection of biological and, therefore, commercial species are already in force to further reduce impacts from this source.

There would be some competition for labor force and materials. Oil and related companies generally offer higher wages than fish processors and municipalities. They have also exhibited willingness to pay a higher price to get materials exactly when and where they need them. This is a luxury small businesses and small towns do not have.

It is conceivable that there could be some short-term shortages of supplies and a less skilled working force because people and transport are totally committed to the oil companies' activities. But, considering the experience gained through OCS sale 39, which used Yakutat and Seward as a support and supply base, and the upper Cook Inlet experience, it is a relatively minor one.

The impact of the unmarketabililty of flavor-tainted fish is another open question. It does happen, but must not be a notable happening because there is seldom a report about it. In all the years of oil activity in Cook Inlet, there has only been one report of one fisherman not being able to sell one load of crab because of flavor tainting. The source of the tainting material is unknown.

Crab and salmon would be the most susceptible to flavor tainting should a hydrocarbon spill occur during the fishing season for these species covering an area where they are fished. Crab pots could be left on the ocean floor until the pollutants drifted away, and could then be pulled through clear water. Some additional expense for either cleaning old buoys and lines, or buying new ones, would be required and would be part of the impact.

Salmon gear (gill nets) would probably need to be replaced should a pollutant event cover them, and whatever salmon were in them would be lost to the market. The chance of impact is thought to be slight, but if it occurs, impact is probable. Damages due to oilspills are covered by the Offshore Oilspill Pollution Fund (appendix F). See section I.C. for a discussion of this fund.

The loss of fishing time because of the proposal activities covers a wide range of possibilities. These include but are not limited to time lost because

of oil in the water over fishing grounds, gear replacement is slow, boats and gear must be cleaned, and help may not be available.

The labor requirements for the onshore construction projects related to this proposal are expected to have a minor effect on the fishing industry. The construction work force is assumed to primarily consist of transient workers who would be housed at onsite construction camps. The projects would be sufficiently large to attract enough labor to an area so that the fishing industry employees that would be lost could be replaced with new arrivals.

The OCS labor requirements in Homer and Seldovia resulting from this proposed lease sale 60 are not expected to have a significant impact on the commercial fishing industry. OCS labor requirements are not substantial and/or they are matched by projected increases in population. The total supply of labor is expected to increase to meet the OCS labor requirements with margin to spare. The OCS labor requirements in Kodiak are minimal and are not expected to affect the Kodiak commercial fishing industry. There may be some local labor conflicts, mostly in Port Lions, but they should be short lived.

The extent to which OCS uses of ocean space would increase fishing costs in a particular fishery would depend on the extent to which the fishing grounds would be used for OCS operations and on the nature of the fishing and OCS operations in areas of joint use. The potential for conflict for these fisheries is discussed by gear type since gear type is a major determinant of potential conflicts.

The long line halibut fleet operates in lower Cook Inlet. The long line gear is particularly susceptible to losses to OCS survey vessels and other OCS vessels that tow underwater gear or are of great draft. Gear losses are expected to occur and fishing costs are expected to increase.

The crab fisheries use pot gear which is left unattended. The high concentration of the gear in some areas would result in a very high probability that gear losses would occur if other vessels enter the areas. OCS ocean space use would occur in the Kodiak king, tanner, and Dungeness crab grounds. Gear losses, therefore, would be expected to occur in these areas except that the majority of the fishing areas in Shelikof Strait are mostly out of the fishing areas and, therefore, away from direct conflict areas.

The bottomfish grounds in the proposed area are developing. Since these fishing areas are not clearly defined, impact assessment for these areas is not possible at this time. However, with the possible exception of gear loss due to OCS operations, losses would likely be minimal. By the time the domestic fishery has fully developed, OCS ocean space use would consist primarily of tanker traffic in well established lanes.

Gear loss is expected to be a major part of the increase in fishing costs in areas in which the two industries will compete for ocean space. Although the magnitude of the gear loss resulting from OCS operations cannot be determined, current gear loss in absolute terms or in terms of total fishing costs are of interest. CFEC data indicate that in the mid-1970's, the average gear loss of vessels participating in Alaska shellfish fisheries was approximately $8,400. This was about 13 percent of the total value of the gear used by these vessels, or about 17 percent of the fishing costs excluding labor costs. These gear

loss estimates include the cost of gear itself and do not include the cost associated with lost fishing time. The gear losses due to OCS operations could exceed the current losses. Lost fishing time because of gear loss could cost far more than loss of crab gear.

Another aspect of the increased fishing cost is the cost associated with collisions between fishing vessels and OCS vessels or structures. Fishing vessel accident data indicate, for the United States as a whole, collisions account for approximately 18 percent of fishing boat accidents, and 45 percent of the collisions result from neglecting the boating rules. The implication is that additional vessel traffic would not substantially increase the cost of vessel accidents, particularly if more attention is paid to the boating rules.

Conclusion: The proposed sale would have little or no effect on the Kodiak, Homer, Port Lions, Seldovia, and Kenai commercial fisheries. The exploratory phase may adversely impact the Kodiak commercial fishery because of competition for labor, and ocean space (seismic boats in crab pot and other fishing areas). These impacts could be severe but would be short-lived.

During production there would be reduced fishing areas (by 8,000± acres) and a possible conflict over travel areas. Experience from other areas (Yakutat and Cook Inlet) have shown that over time (2-5 years) these conflicts can be resolved. Adverse impacts are estimated to be local, short lived, and minor to the commercial fishery as a whole.

Cumulative Effects: Should the activities associated with future sales add to the conflicts identified above, adverse impacts could become serious for a time. Deep-water trawling and long-lining also occur. There may also be conflicts with shipping, especially with the increased tanker traffic from sale CI.

The major multiple-use conflict is between oil and gas activity and commercial fisheries. The salmon fishery is close to shore. Trawling for shrimp occurs at mid-depth, and crabbing with pots occurs from shallow to deep waters depending on the species.

Unavoidable Adverse Effects: The commercial fishing industry would experience adverse impacts from this proposal. There would be increased competition for ocean space, labor (short term), and perhaps supplies (again short term). Some fishing areas would be lost for the life of the project as will some gear and perhaps fishing time. Overall, impacts are estimated to be moderate in the Shelikof Strait area and minor in the Cook Inlet area, but individual fishermen could be more severely affected.

d. Impacts On Marine and Coastal Birds: More than 100 species of marine and coastal birds numbering several million compose a major portion of the marine fauna in the proposed sale area. This avian fauna, especially pelagic birds (alcids) and marine waterfowl, are the most sensitive marine species to hydrocarbon development. Since the turn of the century, acute and chronic hydrocarbon pollution of marine environments has been the major factor contributing to large population reductions along heavily traveled oil tanker routes. Long-tailed duck populations (old squaw, eiders, and scaup) in the Baltic Sea have decreased by 90 percent in the past forty years, while scoter populations which migrate through the Baltic and North Seas have also been

noticeably reduced (Bourne, 1968). Auk and guillemot colonies have been reduced greatly in the vicinity of shipping routes throughout their southern distribution, with localized extermination in enclosed waters, such as the inner English Channel (Bourne, 1968).

An oilspill vulnerability index for marine birds of the northeast Pacific developed by King and Sanger (1979), is based on such characteristics as species range, population, habits, productivity, mortality, and potential exposure to oil pollution. Comparative analysis of species listed in the index supports the conclusion that colonial pelagic species, such as murres, puffins, petrels, and marine waterfowl, such as scoters and eiders, are the avian species most vulnerable to oil pollution.

Three of the five major colonial nesting species (common murres, tufted puffins, and fork-tailed storm petrels) and the greater majority of the marine wintering species in the proposed sale area are among the most vulnerable to oil pollution. The direct effects of oil pollution contact on marine birds are well documented. The initial and most critical effect of oil pollution is the loss of feather water repellency. Oiling causes feather filaments to clump together, leaving gaps in the outer feathers which then permit down feathers to absorb water. In turn, the oiled bird loses its thermo-insulation and buoyancy. Such loss is very likely to result in death from hypothermia, shock, or drowning. Approximately 50 to 90 percent of the birds oiled by a spill never reach the beaches; they sink to the ocean bottom (Nelson-Smith, 1973, Ohlendorf, et al., 1978).

Birds which are only slightly oiled and survive direct oil contact suffer varying degrees of hypothermia, impaired mobility, and other physiological effects which, in addition to indirect effects, may contribute to increased population mortality (Nelson-Smith, 1973).

The most likely indirect effect of oiling on birds is the ingestion of oil while the birds are preening. Oiled birds will instinctively preen their feathers in an attempt to clean them. Oil ingestion is shown to cause various pathological conditions of the kidneys, pancreas, gastrointestinal tract, lungs, and other internal organs (Hartung and Hunt, 1966; Ohlendorf, et al., 1978). Although oil ingestion alone is apparently sublethal, the physiological stress from intoxication and dehydration are significant contributing factors in the deaths of oiled birds, especially those whose feathers have been affected (Ohlendorf, et al., 1978).

An important indirect effect of oil pollution on marine birds and other waterfowl is the probable decrease in reproduction due to oil ingestion, and perhaps more important, the contamination of eggs with oil from the feathers of the parent birds. Reduction of egg laying because of oil ingestion has been reported by Hartung (1965); Ainley, et al. (1979); and Stickel and Dieter (1979). Separate studies indicate oil contamination of eggs significantly increases chick embryo mortality, and decreases nesting success. Stickel and Dieter (1979) showed that very minute quantities of oil (5 microliters) applied to the surface of marine bird eggs caused significant chick embryo mortality under laboratory conditions. Similar chick embryo mortality in gull colonies was demonstrated by Patten and Patten (1978 and 1979), and indicated by Manuwal and Boersma (1977) in field experiments with storm petrels. It is apparent that embryo mortality is caused by toxicity of oil rather than blockage of gas

exchange. Both Patten and Patten (1978) and Stickel and Dieter (1979) showed that even small amounts (20 ml) of weathered oil reduce egg hatching by 50 percent. Oil contamination of nesting birds during the egg incubation period could substantially reduce hatching success for one nesting season. Thus, chronic low level oil pollution near important nesting colonies could effectively reduce productivity and consequently contribute to a possible long term decline in colonial populations.

In addition to the effects of direct contact with oil pollution, marine birds could be adversely affected by reduction and contamination of food sources. A sudden, oilspill-related, local reduction in capelin, euphaussiid crustaceans, or another major food source that occurs during a migration stopover period or during the nesting period could lower reproduction and survival of bird populations that depend on that food source. It is likely that marine birds living in oil-polluted environments may accumulate residues of the relatively persistent aromatic components (Ohlendorf, et al., 1978). These accumulated residues could lead to chronic toxicity in birds and adversely affect their physiology, reproduction, and behavior.

Another major potential cause of adverse effects on marine and coastal birds due to OCS activities is man-made disturbance. The most serious interrelated disturbance problems specifically identifiable in the proposed sale area are increased air and boat traffic near important nesting areas. The effects of aircraft, especially helicopter noise and presence, over nesting colonial birds and nesting waterfowl have been documented. Low flying aircraft passing near bird colonies frighten most or all adult birds off their nest, leaving the eggs and young vulnerable to exposure, predation, and accidental displacement from the nest during hurried departures by adult birds (Jones and Petersen, 1979; Hunt, 1976; and Sowl and Bartonek, 1974). Preliminary evidence has indicated that repeated disturbance could significantly reduce hatching success, fledgling success, and perhaps cause adult abandonment of eggs and young (Gollop, et al., 1972; and Scott, 1976).

Other potential disturbance problems associated with OCS development include possible displacement of birds from important feeding and staging areas due to increased air and boat traffic, and disturbance due to locating onshore facilities near coastal nesting areas.

Gull populations have increased substantially in response to coastal development in the Gulf of Alaska (Patten and Patten, 1979). Such species as glaucous and glaucous-winged gulls have adapted to utilizing human refuse from canneries, processing ships, garbage dumps, and sewer outfalls. Development related wastes have apparently increased the carrying capacity of the environment for these gulls to the apparent detriment of other species. Gulls prey readily on other marine bird eggs and young. The availability of human refuse has probably enabled gulls to increase their numbers and sustain themselves when preferred food sources are absent, thereby increasing the pressure on their preferred prey when available during the nesting season. Unless disposal of human refuse associated with coastal development, including OCS development, is strictly controlled, changes in competition and predation between gulls and other marine birds are likely to occur. Several species of marine birds, such as murres and kittiwakes, may decline markedly while gull populations accelerate. Because of their association with garbage dumps, sewer outfalls, and municipal water supplies along the coast of Alaska, gull species are potential

carriers of human bacterial and parasitic diseases, and could be a serious health problem (Patten and Patten 1978 and 1979).

The major adverse impacts from OCS activities in the proposed sale area could come from oil pollution of the marine environment and man-made disturbance. The reader is advised to review preceeding discussion regarding the qualitative nature of potential effects of the proposal or the alternatives on birds.

Analysis of the Geological Survey oilspill trajectory model (sec. IV.A.1.d. and appendix D) results indicate four oilspills are likely to occur in the Cook Inlet-Shelikof Strait area during the life of the project. However, the analysis is based on the assumption that commercial resources will be found throughout the sale area. This probability is only 5 percent (see section II.A). Assuming that the mean case commercial deposits are found, the probability that one or more oilspills will occur and contact land within 3 days is 77 percent, and within 30 days is 96 percent (appendix D, table 8). (Note: Unless otherwise specified, spill contact probabilities refer to contact made within 10 days of simulated launch.) Coastal habitat areas on both sides of Shelikof Strait have the highest probability of being contacted by an oilspill within 3 days as shown on table 14, appendix D, table nos. 15 and 45. The Barren Islands and Kamishak Bay-Augustine Island coastal areas are of moderate risk from oilspills contacting land (appendix D, table 14, nos. 53 and 54). The large birds colonies of the Barren Islands could sustain high mortality if an oilspill reached or came near the islands during the nesting season. High density offshore foraging areas (appendix D, fig. D-1) are the most likely targets to be contacted by an oilspill within 3, 10, or 30 days. For example, during the fall-winter season, Shelikof Strait offshore foraging areas have a 57 percent chance of being contacted in 3 days, and a 63 percent probability by oilspills associated with the proposal during the winter (appendix D, table 8). The northern Kachemak Bay foraging area has a slightly greater chance (38%) of being contacted by oil during the spring-summer season within 10 days than during the fall-winter, 36 percent probability (appendix D, table 8). On the other hand, Shelikof Strait foraging areas are more vulnerable during the winter season (63%) than during the spring-summer (54%).

Preliminary bird surveys indicate that the western coastal areas of Kodiak-Afognak Islands are important wintering areas for sea-ducks and alcids (Forsell and Gould, 1980; Trapp, 1979). Oilspills that occur in Shelikof Strait could have major impacts on these populations. The inner bay wintering areas could not be analyzed in the trajectory models. However, if an oilspill occurs along the proposed pipeline route in Kupreanof Strait or if a tanker spill occurs near the proposed Talnik Point tanker facility near Whale Passage, it is very likely that major impacts on marine bird populations in this important foraging area could occur. The trajectory analysis does not include potential spill points within Marmot Bay or Kupreanof Strait. Kachemak Bay nearshore areas and the inner bay have a very low chance (1%) of being contacted by an oilspill within 30 days (appendix D, table 14, nos. 76, 77, and 78, fig. 5). However, the Anchor Point (land segment 75) area has a higher chance (8%) of being contacted by an oilspill. This probability increases to 45 percent within 10 days with the addition of the present lease area and existing tanker terminal and transportanker activity in that area (appendix D, table 21, no. 75).

Kamishak Bay-Augustine Island nearshore areas have a fairly high probability of being contacted by an oilspill (appendix D, table 8, and fig. D-2, area H).

Migratory bird populations that stage in this area could be directly affected during spring and fall migration periods.

Coastal habitat areas that show the highest probability of being hit by an oilspill include the eastern side of Shelikof Strait from Kupreanof Strait north to Malina Bay, including the western side of Raspberry Island (table 14, appendix D, nos. 14 and 15), and on the western side of Shelikof Strait from Kinak Bay north to Kukak Bay (appendix D, table 14, no. 45 and fig. 5). Western Raspberry Island-Kupreanof Strait has a 23 percent probability of being hit within 10 days while Kinak-Kukak Bay Area has a 31 percent probability (appendix D, table 14, nos. 14 and 15). The highest probability among shoreline segments in lower Cook Inlet is 12 percent for Kamishak Bay (appendix D, table 54). These data indicate that coastal habitats within Shelikof Straits show higher risk to oil spills than lower Cook Inlet tracts because of the proposed action.

In summary, assuming that commerciable oil is found, sensitive marine bird populations that occur in the proposed sale area would be at high risk (greater than 20% probability of large populations being contacted by an oilspill) from oil and gas development throughout the proposed lease area.

Large nesting colonies of vulnerable species on the Barren Islands may be severely affected by oilspills that reach the islands or occur within important offshore concentration areas. Tens of thousands of shearwaters that concentrate in the northern foraging area (fig. D-1) could also be adversely affected directly and indirectly by an oilspill. Highly vulnerable sea ducks and alcids that winter in the Shelikof Strait are likely to suffer major impacts (25 to 75% mortality of a species population) from an oilspill in the Shelikof tract area, especially during the winter and fall.

If a major oilspill occurs in the Kupreanof Strait or Whale Passage areas, major impacts (25 to 75% mortality of a species population) to marine birds are very likely to occur, since this area is a very important year-round concentration area in the Kodiak-lower Cook Inlet region.

Chronic small oilspills are the most likely spills and inevitable in occurrence to a certain degree. Such spills are most likely to be a problem near shore facilities and along tanker routes. Even small quantities of chronic oil discharges in addition to accidental discharges, if they occur in an important marine bird concentration area, could have a detrimental effect on marine birds that utilize the area.

Disturbance from air and boat traffic and human presence are potential threats to colony nesting birds, other nesting birds, and apparently to a lesser extent, staging and foraging birds. Numerous sea bird colonies along the coast of the proposed sale area could be affected by increase air and boat traffic during OCS development activities. Large colonies on the Barren Islands, Gull Island near Chinita Bay, Flat Island south of Kachemak Bay, Chisik Island colonies, and other bird colonies in the area could be subject to additional air traffic from OCS support activites perhaps which may lead to reduced productivity and population reductions from disturbance. The responsive increase in gull populations to human development and to associated increases in waste and garbage disposal sites could have a significant adverse effect (greater than 20% long term population reduction) on other marine bird species.

The greatest risk to coastal bird habitats due to oilspills is within Shelikof Strait. The overall probabilities for oilspills reaching coastal habitats throughout the proposed sale area is 77 percent within 3 days increasing to 96 percent within 30 days (appendix D, table 8). Projected marine bird offshore foraging areas in the Shelikof Strait show a greater risk from the proposal than the projected lower Cook Inlet foraging area. The former foraging areas are at a higher risk during the fall and winter while the latter foraging area is at a slightly higher risk during the spring-summer. The Kupreanof Strait-Raspberry Island western coast and the Kinak Bay-Kukak Bay area on the western side of the Shelikof Strait are coastal habitats of greatest risk from an oilspill within the proposed lease area.

Conclusion: If commercial finds of oil occur within the proposed lease area and if a major spill occurs, marine and coastal birds could be severely affected. Depending on the location, size, and season of the spill, thousands and perhaps several hundred thousand birds could be directly killed by a large oilspill. Chronic oilspills could reduce bird populations over the life of the project. Noise and other human disturbances of nesting birds could have an additional degradation effect on several species populations. The proposal could have a major impact on marine bird populations within the lower Cook Inlet-Shelikof Strait and Kodiak areas. Vulnerable species could take as long as 50 years to recover from a single 50 percent mortality event.

Cumulative Effects: The oilspill analysis projects the most likely number of spills to be 7 from existing hydrocarbon development activities in the area, increasing to 11 spills with the proposal provided that oil is found throughout the sale area. The combined effect of the proposal with existing hydrocarbon development already occurring within the Cook Inlet significantly increases the risk of oilspills occurring within the lower Cook region. For example, the Kachemak-Barren Island offshore foraging habitat probability of being contacted by an oilspill increases from 38 percent during the nesting season with proposal to 86 percent (the proposal and existing lower Cook Inlet OCS lease sale, appendix D, table 8). The addition of existing tankering activities increases this probability to 95 percent, (appendix D, table 21). The probability of the Barren Islands being hit by one or more oilspills increases from 14 percent (the proposal) to 46 percent (the proposed plus the existing lease area, appendix D, table 8), and would increase to 58 percent when including existing tankering activities, (appendix D, table 21). Coastal areas such as Kamishak Bay, Anchor Point, and Augustine Island are also at high risk from the potential cumulative effects of the proposal, existing lease area, and existing tankering in the area. For example, Bruin Bay contact point (land segment 54) oilspill contact probability increases from 12 percent with the proposal to 55 percent when combined with existing hydrocarbon activity projected risks, (appendix D, fig. IV.A.d.-15, table 21, no. 54). Within Shelikof Strait, cumulative risks to coastal habitats and to marine bird foraging areas, significantly increases. For example, coastal habitats on the western side of Shuyak Island from Dark Passage south to Black Cape on the northwestern coast of Afognak Island spill contact probability would increase from 15 percent (the proposal) to 29 percent when combined with existing hydrocarbon activity projected risks, (appendix D, table 21, no. 17). In the Uganik Island area, from Kupreanof Straits south to Uganik Bay (land segment 14), oilspill contact probability increase from 9 percent (the proposal) to 21 percent when combined with existing hydrocarbon activity projected risks (appendix D, table 21, no. 14). Several bird colonies and important winter

concentration sites have been identified in the above coastal areas. For projected seabird foraging areas in Shelikof Strait, oilspill contact probability would increase from 63 percent (the proposal) to 88 percent when combined with existing hydrocarbon activity projected risks during the fall-winter period. Risk from oilspills increases dramatically during spring and summer for Shelikof Strait foraging areas. When comparing existing tankering, risks increase 8 percent (appendix D, table 23); when comparing with the proposal, risks increase 54 percent (appendix D, table 8).

Other planned development projects in the region (see sec. IV.A.1.h) could increase the risk of adverse impacts on marine and coastal birds. Development of the Beluga Coal field could increase marine traffic in Cook Inlet; thereby increasing the risk of tanker accidents and perhaps increasing disturbance of coastal habitats and marine bird populations. Development of the Pacific LNG facility at Nikiski will inevitably increase tanker traffic in lower Cook Inlet; thereby increasing the probability of tanker accidents and increasing the risks of adverse impacts on bird populations.

In conclusion, the cumulative effects of the proposed action, existing hydrocarbon activity, and planned development projects could increase the risk of adverse impacts on marine and coastal birds by 50 percent or more. The probabilities of potential impacts increase significantly when comparing the proposal with existing hydrocarbon activities. However, these probabilities are partially based on the assumption that hydrocarbons will be found within both the existing and proposed sale areas, and thus, the probabilities could be an overestimate of the cumulative risks. Inevitably, the proposal when combined with existing State hydrocarbon activities and other air and marine traffic will increase the chances of significant impacts on marine and coastal bird populations.

Unavoidable Adverse Effects: The proposed action would cause increased hydrocarbon activities and related marine and air traffic within lower Cook Inlet and Shelikof Strait. The frequency of permitted hydrocarbon discharges and accidental spills would likely increase.

Encounters between marine birds and minor spills could contribute to some bird mortality. Increases in marine and air traffic would unavoidably cause disturbance of some marine and coastal birds. Coastal habitats would be unavoidably disturbed, perhaps reducing utilization of these areas by some species.

In conclusion, the proposed action could result in mortality of and disturbance to some marine and coastal birds. Vulnerable species could be expected to suffer population decreases for an indefinite period of time.

e. Impacts on Marine Mammals (Fur seal, sea lion, harbor seal, sea otter): This section presents an overview of potential impacts on fur seals, harbor seals, sea lions, and sea otters. Cetaceans and endangered species are treated in section IV.A.2.f. Oil pollution and disturbance due to increased human activity could affect marine mammal populations native to the proposed sale 60 area. Other impact-producing agents which could be associated with petroleum development and production include marine disposal of drilling muds and cuttings, marine disposal of formation and cooling waters, dredging and filling (such as that associated with pipeline construction), and secondary development. It is not possible to accurately predict on a long-term

basis how interaction of these major variables may affect each mammalian species found in or near the proposed sale area. However, available information can at least broadly define possible effects and help to identify those species most sensitive to various perturbations, particularly those effects observable on a short-term basis.

Short-Term Direct Oilspill Effects: Direct (and indirect) effects of spilled oil would vary depending on the population density and physiological status of the affected mammal species, season and meteorological conditions, chemical or physical characteristics of the spill, duration of exposure, type of exposure (e.g., ingestion versus external contact), and other factors. An effect which is often thought to be associated with spilled petroleum products is direct mortality to marine mammals due to acute contact, such as what may occur when individual organisms are coated by spilled oil. Evaluations of observed marine mammal contact with spilled oil or of potential contact, such as the 1969 Santa Barbara blowout, have been limited as to the extent of direct mortality on affected species. Studies suggest that for certain species, direct mortality as a result of contact with spilled oil may not be an immediate result. LeBoeuf (1971), who evaluated effects of the Santa Barbara spill, concluded, "the crude oil which coated many weaned elephant seals at San Miguel Island in March and April had no significant immediate nor long-term (1-15 months later) deleterious effect on their health. Had the rookery been contaminated earlier in the season when females were nursing, pups might have ingested the crude oil and more serious consequences might have ensued." Brownell and LeBoeuf (1971) concluded that crude oil contamination of California sea lion rookeries on San Miguel Island due to the same spill did not have a significant effect on pup mortality. Davis and Anderson (1976), reported no significant difference in the mortality of oiled and unoiled grey seal pups found in surveys of polluted beaches in England. On the other hand, species such as sea otters or fur seals may be particularly sensitive to oil contact. These species rely on their fur for insulation as opposed to other species which minimize heat loss with a layer of blubber. Kooyman and Costa (1978) found that the metabolic rate of a sea otter increased 22 percent after oiling of one-third of the dorsal surface with only 38 milliliters of crude oil. Other experiments by the latter authors indicated that oiled sea otters demonstrated increased metabolic rates to 1.4 times the normal rate. These effects were observed in some cases to last a few days to 2 weeks, but it was concluded that after repeated oiling, return to normal metabolic rates may be impossible. Thus, exposure of sea otters to crude oil in natural environments "would probably cause significant thermal stress and could lead to hypothermy and/or pneumonia resulting in death," (Kooyman and Costa, 1978). Kooyman, et al., (1976) found that thermal conductance of oiled fur seal pelts increased from 1.4 to 2.0 times that of unoiled pelts. They concluded, "Any contact with oil at any time of year would have a profound influence on the health of individual northern fur seals through increases in pelt conductance with concommitant increases in metabolic rate. That death would inevitably follow such contact cannot be verified from the present effort. However, considering that 1) oiled animals have greatly increased maintenance costs, and 2) they are extremely reluctant to enter sea water (where their food is found), it is clear that the health of oiled animals would be in serious jeopardy." (Kooyman, et al., 1976.)

Therefore, direct mortality from oiling as a result of short-term effects on animal heat dynamics would be most likely to occur for sea otters and fur

seals as compared to sea lions or seals. However, ultimate responses of local populations to direct exposure to oil pollution will vary depending on such factors as species productivity, population status at the time of a spill or spills, other sources of mortality, changes in species distribution, and/or unrelated changes in habitat quality.

Response to acute contact with oil by certain marine mammals may be manifested by a variety of apparently non-lethal physiological effects. Geraci and Smith (1976) found that ringed seals immersed in crude oil for 24 hours suffered transient eye problems, and minor kidney and, possibly, liver lesions, but could detect no permanent damage. The same workers found that harp seals fed 75 milliliters of crude oil suffered no significant effects. Geraci and St. Aubin (1979), in review of the latter research, considered the dosage used as "substantial," but that the pathological changes could have been induced by administration at higher but "unrealistic" levels. Geraci and Smith (1977), concluded that seals are not known to be carrion feeders and any oil that they might consume from live prey would be negligible. Also, Geraci and St. Aubin (1979), concluded that their experiment exposed ringed seals to gaseous volatile hydrocarbons at concentrations higher than would be encountered as a result of an oceanic spill, yet no associated lung pathology could be detected. Davis and Anderson (1976), detected a lower mean weight of oiled grey seal pups as compared to unoiled pups in their field analysis, but could not attribute the difference to the effects of oil alone.

It can be concluded, therefore, that short-term exposure of certain phocid seals (such as ringed and, probably, harbor seals) may yield relatively minor physiological effects such as eye irritation or non-permanent kidney and liver injury. Behavioral effects are not well understood, but for the few species studied such as fur seals and sea otters, increases in grooming behavior are likely (Geraci and St. Aubin, 1979). As observed in ringed seals (Geraci and Smith, 1976), increased aggression and irritability may also result. Since field observations of sea lions suggest that scent is important in recognition of pups by females, it is possible that coating of animals or other contact with oil could inhibit such recognition and lead to pup abandonment and starvation (Schneider, 1980; Alaska Department of Fish and Game, personal communication, 1980). For many species, baseline behavioral studies are lacking; and for the species present in lower Cook Inlet and Shelikof Strait, little information exists which may serve to predict behavioral response to oilspills or how such response would ultimately impact population trends and/or structure.

Long-Term and Chronic Direct Effects: It is likely that longer exposure or repeated exposure of marine mammals to spilled oil could result in more significant physiological effects than those discussed above, particularly in terms of irritation of eyes, liver tissue, or degradation of pelage (especially for sea otters and fur seals).

The ultimate direct effects of low-level chronic oil contact on marine mammals are not readily predictable. In fact, it has been suggested that long-term effects can only be assessed under field conditions (Geraci and St. Aubin, 1979), primarily through monitoring efforts. One possible result of low-level or chronic pollution would be to contribute to physiological stress on marine mammal populations which may be at or near carrying capacity. Some writers, such as Geraci and Smith (1977) have suggested that oil contact may trigger death in stressed seals. Stress in wild mammal populations (characterized by

decreased reproduction, decreased resistance to disease, and increased mortality) may be induced by a complex of factors related to population density, social interaction, nutritional factors, genetic changes, climate, and a host of other environmental influences. The relative importance of stress-related factors suspected of causing changes in wild microtine rodent populations has been studied and debated for years (Christian, et al., 1965; Christian, 1971; Batzli, 1970; Keller and Krebs, 1970; Selye, 1973; and Terman, 1965). From this and similar research with other mammalian species, it can be concluded that responses of wildlife populations to individual stressors is extremely varied, and the extent to which chronic oil pollution would contribute to physiological stress and thereby affect marine mammal populations is also variable. Populations or individual wild animals which appear to be under stress associated with density, habitat deterioration, or reduced food availability, may respond to interactions of these factors with chronic, low level oil contact.

There is little, if any, evidence that sea lions, sea otters, fur seals, or harbor seals in the Cook Inlet area are currently or generally susceptible to major stress-mediated responses to chronic or low-level oil spillage. Localized sea otter populations at or near carrying capacity may demonstrate responses of indeterminant nature and extent.

Indirect Effects of Oil Pollution: Indirect effects of oil pollution on marine mammals would be those associated with destruction and contamination of food sources, or essential habitat. Species most susceptible would be those which rely on a restricted or sedentary food source (such as the sea otter), or those with a behavioral sensitivity to habitats which have been contacted by oil. Sea otter populations are limited to a significant extent by food availability. Therefore, changes in food supply caused by oilspills could be of major consequence to sea otters in lower Cook Inlet and Shelikof Strait. Marine mammal species which feed on pelagic fish (such as sea lions, fur seals, and harbor seals) are probably less sensitive to localized loss of food sources.

Substantial gaps exist in available information regarding potential behavioral-induced exclusion of marine mammals from habitats which have been oiled. Observations recorded in the literature reviewed under Short-Term Direct Oilspill Effects suggest that certain species are not particularly sensitive or responsive behaviorally to the presence of oil on rookeries.

Other indirect effects of oilspills on marine mammals include possible bioaccumulation of hydrocarbons and petroleum-derived compounds. According to Risebrough (1978), little is known about pathways of possible accumulation and virtually nothing is known of their persistence in marine mammals. Neff (1979) in a review of literature on toxicity and ecological effects of marine disposal of drilling muds, concluded that heavy metals associated with used drilling muds are of relatively low acute toxicity, have a very limited bioavailability, and therefore have little potential for accumulation in marine mammals if disposed of at sea. Certain species of seals are suspected of having abilities to detoxify methyl mercury obtained through ingestion, and sea otters may have an inherent mechanism which protects them from the effects of cadmium (Risebrough, 1978). Natural and background levels of heavy metals, chlorinated hydrocarbons, and other toxic substance in the marine environment (or marine mammal tissues) would make it extremely difficult to evaluate the

effects of bioaccumulation of petroleum-related hydrocarbons on marine mammals. At present, accumulated chlorinated hydrocarbons (e.g., DDT) from industrial or agricultural sources have been the most important factors affecting California sea lions, ringed seals, and harbor seals (Risebrough, 1978).

Noise and Disturbance: Human disturbance related to oil and gas support activities during both the exploratory and development stages, especially air traffic near pupping grounds (such as Augustine Island) could have significant adverse effects on harbor seals (Pitcher and Calkins, 1977, 1979). Noise-related disturbance from low flying aircraft, especially helicopters, could cause mass and rapid exodus of adult seals from rookeries and hauling areas. If this occurred during the pupping season (mid-May through mid-July), pup mortality would occur from trampling or abandonment of pups. Pups deserted on the beach during such a disturbance may not be recognized by the mother when hauling out reoccurs. Harbor seals may also be sensitive to disturbance during their molting period from mid-August to mid-October (Pitcher and Calkins, 1977; 1979). Effects of disturbance due to underwater noise (e.g., vessel engines, seismic operations) on seals, sea lions, or sea otters are possible but their extent is unknown.

Disturbance of thousands of sea lions during the pupping and breeding seasons (May-July) at important hauling grounds on Sugarloaf or Marmot Island could have an adverse effect on sea lion populations. Frequent aircraft or boat traffic near the islands could cause disturbance of sea lions during the pupping season and could cause increased pup mortality and abandonment of important breeding and pupping grounds (Pitcher and Calkins, 1977, 1979).

Populations of other species endemic to the lower Cook Inlet and Shelikof Strait area (e.g., fur seal and sea otters) are probably not as susceptible to effects of noise and disturbance as are sea lions and harbor seals because the former species are more widely dispersed and/or do not utilize rookeries in the sale 60 area. Although localized response to disturbance is possible for fur seals and sea otters, effects of noise and disturbance on reproductive success or mortality rates of populations at large are probably of minor importance.

Natural Gas and Gas Condensates: Currents, wave action, and wind would be expected to disperse, dilute, and evaporate gas and gas condensate pollutants rapidly. However, animals in the immediate vicinity of a gas leak may be affected at the occurrence or shortly after a leak would occur. Inhalation of toxic vapors could be fatal to marine mammals. Pipeline burial, which may temporarily increase benthic fauna that attract marine mammals (especially sea otters or harbor seals), would increase such risks to individual animals.

Other Impacts: Hamilton, et al., (1979) reviewed other impact-producing agents which may be associated with oil and gas exploration and development. Factors which may affect marine mammals include marine disposal of formation waters or cooling waters, shoreline alteration, facility siting, physical presence of offshore structures, dredging and filling, and secondary development. The extent of such impacts is most readily assessed in localized or short-term analysis and projections. During exploratory phases of the proposed sale, most of these impacts on marine mammals are not expected to be significant unless noted otherwise below. Of major concern would be permanent loss of habitats as the result of facility siting and secondary development

associated with development phases. Existing legislative constraints and permitting procedures may serve to minimize localized impacts. Long-term and aggregate effects of such factors are treated under "Cumulative Effects."

The Barren Islands, Marmot Island, and possibly the Puale Bay area would be locations where direct effects of spilled oil on sea lions would be most substantial if animals are contacted, assuming spilled oil induced behavioral responses such as rookery abandonment, pup desertion, or caused direct mortality. Oilspill risk analyses show that the Barren Islands area (including Sugarloaf Island) (appendix D, table 8, Area C) has a moderate (11%) chance of spill contact over the life of the field due to spills associated with the proposal. (Note: Unless otherwise specified, oilspill risk analyses made in this section will refer to probabilities conditional on the development of a production field and to spill contact rates within 10 days of simulated launch.) Of the Barren Islands, Ushagat Island, an area noted for at least three sea lion hauling areas (used by 1,000-2,000 animals), is at highest risk with a probability of spill contact of 6 percent due to the proposed sale (appendix D, table 14, No. 81). Latax Rock just north of Shuyak Island is known to receive use by at least 1,000-3,000 sea lions and would be subjected to a moderate (15%) spill risk (appendix D, table 14, No. 17). However, Sugarloaf Island (used by as many as 10,000 sea lions) has a low (less than 2 percent) probability of spill contact over the life of the field (appendix D, table 14, No. 82), although areas surrounding the island have an 11 percent chance of spill content. Marmot Island and Puale Bay shores also are shown (appendix D, table 14, Nos. 22 and 41, respectively) as having low probability of spill contact over the life of the field. Therefore, direct effects of spilled oil on major concentrations of sea lions seem relatively unlikely as a result of the proposal. Due to known mobility of sea lions, however, it is possible that large concentrations could occur in areas of higher risk. Offshore areas in Shelikof Strait also are known to receive heavy use by sea lions (e.g., the feeding area near Puale Bay) and are probably at a higher risk than that reflected by the above-mentioned land segments. Also, probabilities of spills from the proposal affecting areas surrounding certain shorelines are high (e.g., north-northwestern Kodiak Archipelago (area D), 48 percent chance of contact, appendix D, table 8), suggesting that indirect effects on food sources are likely. As discussed in section IV.A.2.f., results of Dames and Moore (1980) indicated that movement of spills originating in lower Cook Inlet will be confined primarily to lower Cook Inlet and/or Shelikof Strait. Therefore, spills in lower Cook Inlet from the proposed sale will pose less threat of oil contamination of important sea lion feeding areas in the Gulf of Alaska, such as Portlock Bank, than they would to feeding areas in the confines of lower Cook Inlet. However, chronic spills in the Marmot Bay area associated with a tanker facility could affect the Marmot Island sea lion rookery, at least indirectly.

Harbor seal concentration areas on land segments of Shuyak Island and north Afognak Island show low to high probabilities of spill contact (appendix D, table 14, nos. 15-22), but the overall nearshore area, including marine habitats of the entire north and northwestern Kodiak Archipelago (appendix D, table 8, area D) has a high probability of spill contact over the life of the field as a result of the proposal. Tugidak Island, an area supporting at least 13,000 harbor seals, is shown to have a very low probability of contact by spills as the result of the proposed sale. Other concentration areas in Shelikof Strait, Alinchak Bay, Puale Bay, and Wide Bay show low probability of

spill contact (appendix D, table 14, Nos. 38 and 41). Shorelines in the vicinity of Seal Island and Perenosa Bay, an area identified as a harbor seal pupping area, were found to be at low risk (0-1%) of spill contact (appendix D, table 14, nos. 19 and 20). Augustine Island, another pupping area, is shown as having low probability of spill contact (9% chance, appendix D, table 14, no. 56), but the general Kamishak Bay area was shown to be under high risk (appendix D, table 8, area H) suggesting that direct effects of oilspills on Augustine Island rookeries may be of low probability, but indirect effects such as reduced habitat quality associated with chronic spills in surrounding areas are of high probability. The most probable zone of impact on fur seal concentrations would be the Portlock Bank area, on a seasonal basis. Therefore, impacts of oilspills on northern fur seals as a result of the proposal would have low probability due to the likely general confinement of spills to lower Cook Inlet and Shelikof Strait.

Of the four marine mammal species discussed in this section, the sea otter is probably the species most likely to sustain measurable negative direct effects in the event of spill occurrence. This conclusion is based on the relative abundance of sea otters in the area in conjunction with their known sensitivity to oil contact. Oilspill risk analyses show the north and northwest Kodiak Archipelago and Kamishak Bay sea otter habitats as having high probabilities of spill contact (appendix D, table 8, areas D and H). Spills in Kamishak Bay probably would result in at least partial mortality of resident populations, which total at least 500 to 1,000 animals. Mortality of adults and pups could be expected to be particularly high in the northern Kodiak Archipelago area, a population totaling at least 3,000 and possibly as high as 6,000 animals. Population recovery time for spill-related kills would vary depending on the extent benthic food sources would be destroyed. High mortality would also affect patterns of range expansion (see graphic 11). Occupied sea otter habitats which will be subjected to moderate probability of spills as the result of the proposal include the Barren Islands, western Shelikof Strait, and Anchor Point (appendix D, table 8, area C, E, and G, respectively). Approximately 200 to 400 sea otters could be affected in the Barren Islands. The southwestern tip of the Kenai Peninsula, eastern Kenai Peninsula, and Trinity Island-Chirikof Island sea otter habitats are under low or virtually no spill risk (appendix D, table 8, areas A, B, and F, respectively).

The proposal may subject harbor seals and sea lions to the effects of surface or underwater disturbance, particularly that which may be associated with aircraft overflights or vessel traffic in the vicinity of rookeries or hauling areas (see previous discussion). Also, industrial use of existing marine technologies, such as surface effects craft, could cause future disturbance-associated effects in marine mammals. The extent to which such technologies or deleterious aircraft flight patterns would develop in the proposed sale 60 area is uncertain at this time. Localized disturbance or habitat loss of harbor seals could occur if facilities such as tanker terminals are built near concentration areas illustrated on graphic 11. Therefore, it is possible, if not likely, that noise and disturbance associated with exploration, development, and production phases will directly impact sea lions and/or harbor seals in the proposed sale area.

Indirect effects of the proposed sale would most likely be associated with quantitative or qualitative changes in food sources of marine mammals. Ultimate population response to such effects are unknown, but populations would be

expected to be lower. Probably the greatest effect would be demonstrated by localized sea otter populations, and in direct proportion to the above discussed oilspill risk analyses. Those areas inhabited by sea otters with highest risk of spill contact will be most likely to show indirect effects. Local reduction of fish populations (e.g., pollock) could impact sea lions or harbor seals also.

Conclusion: Sea otter populations, particularly those of the northern Kodiak Archipelago, are likely to sustain direct mortality and indirect effects due to oilspills resulting from the proposed sale, assuming the field goes into the production phase. Harbor seals, particularly those of Kamishak Bay and the Shuyak-Afognak Islands, also are likely to be subjected to direct and indirect effects of spills. Major sea lion concentration areas are at low to moderate risk of spill contact over the life of a production field, but surrounding areas are under higher risk and, therefore, it is likely that sea lions will be affected, at least indirectly. Probable sea lion feeding areas in Shelikof Strait, such as offshore sites near Puale Bay, would be located where direct or indirect effects could be acute. Cumulative spill probabilities for known habitats of sea otters, harbor seals, and sea lions are high in both lower Cook Inlet and Shelikof Strait habitats. This further indicates the likelihood that marine mammals will be affected directly or indirectly in this area if the field goes into production. Siting of tanker facilities on eastern Kodiak Island will increase the risk of localized effects on marine mammals of the Marmot Bay area and marine mammal habitats of Portlock Bank. It is possible that the noise and disturbance associated with exploration, development, and production phases of the proposed sale, will directly impact sea lions and/or harbor seals.

Cumulative Effects: Different projects together could have a summation of effects on marine mammals due to aggregate oilspills, noise, or habitat destruction which would exceed that expected of any individual project. For the purpose of this discussion, "cumulative effects" refer to the sum of direct and indirect oilspill effects (e.g., direct mortality, reduction of food sources), disturbance effects, and other types of environmental degradation which may reduce marine mammal habitat quantity or quality. Such effects are assumed to be similar qualitatively to those discussed previously in section IV.A.2.e. Appendix D, table 8, shows that cumulative (proposed sale 60 plus existing lease area) oilspill contact with the marine mammal habitats of eastern Kenai Peninsula, the Barren Islands, and the north-northwestern Kodiak Archipelago has very high probability (areas B, C, and D, respectively) as well as high probable contact with marine mammal habitats in the vicinity of Anchor Point, and southwestern Kenai Peninsula, Kamishak Bay-Augustine Island, and western Shelikof Strait (areas G, A, H, and E, respectively). Sugarloaf Island shorelines show a medium (11%) cumulative spill contact probability (appendix D, table 14, no. 82). Appendix D, table 14 shows shorelines in the vicinity of Uyak Bay north to Uganik Bay (appendix D, table 14, nos. 12, 13, 14) as having low to high cumulative probability of spill contact as compared to low to moderate probabilities for the proposed sale alone. Probable spill contact is high (23%) in the vicinity of Capes Ugat and Uganik. In western Shelikof Strait, Cape Gull has high probability of cumulative spill contact, and Takli Island Rock has medium probability of cumulative spill contact (appendix D, table 14, nos. 45 and 44, respectively). Puale Bay (appendix D, table 14, no. 41) is shown as being subjected to low cumulative probability of spill contact. Tables 23 and 25 show that existing tankering is presently

subjecting certain marine mammal habitats in the sale area to substantial risk of spill contact. Tables 20 and 21 show that the cumulative probabilities of the existing lease sale, proposed sale, and existing tankering could be very high for the eastern Kenai Peninsula, the Barren Islands, the northern Kodiak Archipelago, the Kalgin Island area and the shores of Kennedy Entrance. The areas mentioned immediately above are known habitat of sea otter (eastern Kenai Peninsula, Barren Islands, north-northwestern Kodiak Archipelago, Anchor Point, southwestern Kenai Peninsula, and Kamishak Bay-Augustine Island), locales of sea lion concentrations (Barren Islands, northern Kodiak Archipelago, Cape Ugat, Cape Gull, Takli Island Rock, and Puale Bay), and harbor seal hauling areas (many areas mentioned above, especially the Kamishak Bay-Augustine Island vicinity and Afognak-Shuyak Island areas).

It can be concluded that direct mortality of sea otters associated with cumulative spills resulting from the proposed sale and existing lease sale are highly likely, and that oilspill-induced indirect effects through reduced habitat quality and/or population productivity may also occur. Cumulative spill rates are high enough in the northern Kodiak Archipelago to reasonably conclude that long-term reduction of inter-tidal benthic invertebrate standing crops are likely, and therefore may lead to reduced carrying capacity of the area for sea otters. Similar effects on harbor seals as the result of cumulative spills may occur, as well as for sea lions. Of particular concern is the apparent moderate cumulative vulnerability of Sugarloaf Island to spill contact indicating that a major sea lion concentration in the area could be affected, at least indirectly, by chronic oil contamination. An example of a possible effect would be lowered reproductive success due to long-term or population-wide changes in animal behavior or physiological conditions induced by chronic spills. Whether such a response would occur in sea lions of the area is speculative at this time. Exposure of the Marmot Island sea lion rookery to chronic cumulative hydrocarbon pollution which might be associated with future development of a tanker facility at Talnik Point and of proposed sale 61 (east of Kodiak Island) could compound undesirable sea lion population responses. Also, movement of tankers over the Portlock Banks to Marmot Bay probably would increase risks to the banks, an important feeding area for sea lions. It is uncertain how the proposed sale would contribute to cumulative effects of hydrocarbon pollution from non-petroleum industry sources (e.g., urban runoff, general marine shipping), but such sources may be relatively minor compared to spills projected for the proposed and existing sales.

Due to the relatively low importance of lower Cook Inlet and Shelikof Strait to northern fur seals, cumulative oilspill effects as a result of the proposed sale, plus the existing sale, are not expected to be great in the sale 60 area proper; nor are effects of the proposed sale expected to contribute significantly to whatever cumulative oilspill effects or disturbance may result from other lease sales (e.g., sale 55) in the range of this species. However, this alternative does pose oilspill risks to fur seals utilizing the Portlock Banks which probably would not be incurred over Alternatives IV or V. Sea lions, which also range far from the proposed sale area, may be impacted by other OCS lease sales. Since the proposed sale is relatively close to major sea lion production areas, its impacts are probably of greatest potential influence on this species. Other lease sales may also affect harbor seals and sea otters. However, it is unknown whether the population-wide response of these species would ever be attributable to cumulative outer continental shelf exploration and development.

Levels and effects of cumulative disturbance associated with the proposal and other potential projects (sec. IV.A.1.g.) on fur seals, sea lions, sea otters, or harbor seals are unknown. Harbor seal and sea lion sensitivity to noise and disturbance suggest that cumulative pup mortality or rookery abandonment could be higher as a result of proposed sale 60 plus the existing CI sale than would be expected from either project alone. Effects of noise and disturbance from non-petroleum industry sources (e.g., expansion of recreational boating/ aircraft use) may contribute to overall disturbance, but the future extent of such perturbations is unknown. Cumulative effects of expansion of harbor facilities at Homer and increased marine shipping due to the Beluga Coal Field project, may be more significantly disturbing influences than activity associated with petroleum exploration and development. Siting of tanker facilities near harbor seal hauling areas, particularly on the eastern side of Kodiak Island, may add or lead to future disturbance associated with development of proposed sale 61. Also, potential cumulative disturbance of the major sea lion rookery on Marmot Island or contamination of feeding areas of the Portlock Banks may occur if tanker facilities are sited as proposed.

Indirect cumulative food source-related changes in habitat quality resulting from the proposed sale, other sales, and other listed projects (sec. IV.A.1.g.) may impact marine mammals. The ultimate effect of these or non-oilspill indirect impacts (e.g., cumulative loss of habitat to industrial sites) are unknown, but could possibly lead to lower standing crops and productivity of mammalian populations.

Unavoidable Adverse Effects: It is very likely that sea otter populations will sustain some mortality as a direct result of spills associated with the proposed lease sale. Due to the high probability of spills in certain areas, it is likely that habitat deterioration and/or food source loss will occur, at least on a localized basis for sea otters and harbor seals in lower Cook Inlet, Shelikof Strait, and possibly east of Kodiak Island (as may be associated with tankering over Portlock Bank to Marmot Bay). It is possible, if not likely, that unavoidable disturbances of sea lion or harbor seal concentrations will occur as a result of long-term changes in transportation systems, localized impacts of facility construction, or localized short-term effects of aircraft/ boat noise.

f. Impacts on Endangered Species and Non-Endangered Cetaceans: Major impact-producing agents affecting endangered and non-endangered cetaceans could be oil and gas pollution, noise or other disturbance, and/or habitat losses.

Direct and Indirect Effects of Oil and Gas Pollution: There is no evidence that cetaceans are able to detect hydrocarbon pollution. Accounts from past oilspills show that marine mammals such as seals and sea lions may not avoid oil; however, there has yet to be found a confirmed case of a whale, dolphin, or porpoise found coated or fouled with oil (Geraci and St. Aubin, 1979) as a result of contact made while alive. Although oiled cetaceans have not been observed, the nature of their skin suggests that they may be vulnerable to effects of surface contact with hydrocarbons (Geraci and St. Aubin, 1979). The epidermis is not keratizized, but composed of live cells (Geraci and St. Aubin, 1979). Geraci and St. Aubin (1979) reported that cetacean epidermis is virtually unshielded from the environment, and may react to substances such as crude oil or gas condensates in a manner similar to sensitive mucous membranes.

Field observation of at least one instance of possible contact of gray whales with spilled oil did not show evidence of extreme effects. In 1969, the entire northward migration of gray whales passed through or near the area contaminated by the Santa Barbara Channel spill, yet the number of gray whales strandings was not significantly different from previous years (Brownell, 1971). Gas chromatograph analysis of tissues of a gray whale stranded in the vicinity of the spill did not indicate the presence of crude oil.

In addition to potential cutaneous contact with oil (or gas), inhalation of toxic substances or plugging of blowholes by oil have been cited as possible threats to cetaceans. Certainly the former is a possibility to the extent that whales may be in the vicinity of a spill prior to the evaporation of toxic compounds. The latter event has never been documented in the scientific literature. The typical breathing cycle of cetaceans involves an "explosive" exhalation followed by an immediate inspiration and an abrupt closure of the blowhole (Geraci and St. Aubin, 1979). This mechanism prevents inhalation of water and should be discriminatory of gas condensates and oil; however, toxic hydrocarbon gas could be inhaled. The effects of gas condensate or gas vapor inhalation on cetaceans are unknown.

Cetacean vulnerability to hydrocarbon ingestion would vary with species, type of hydrocarbon, and nature of the spill. Tomilin (1955) reports that cetaceans, especially benthic feeders, have a poorly developed sense of taste, and the presence of foreign bodies in cetaceans stomachs attests to this. Thus, whales may not be able to differentiate between hydrocarbon contaminated and uncontaminated food. Gray, fin, humpback, and possibly sei whales, which have been observed near the proposed sale area (graphic 12), are the endangered whales most likely to be affected by direct contact with or ingestion of pollutants as a result of the proposed sale. Of the non-endangered cetaceans, it is most likely that Dall and harbor porpoise could also be affected. Another potential direct effect of spilled oil on certain whales is that of fouling of baleen with subsequent decrease in feeding efficiency. The probability of such fouling and effects on feeding efficiency is directly linked to probabilities of spills and whale contact with such spills (see later discussion). It is not practical to predict eventual population response on endangered whales as a result of baleen fouling at this time. Effects of bioaccumulation of toxic substance in cetaceans are not well understood.

The greatest potential indirect impacts from oil and gas activities on cetaceans would be reduction of food sources from acute or chronic hydrocarbon pollution, especially in nearshore areas such as near oil loading terminals, or in important offshore feeding areas such as the Portlock Bank.

As discussed previously, most of the baleen whales are seasonal feeders relying almost entirely on the abundant food sources of the Gulf of Alaska, Bering Sea, and Arctic Ocean for nourishment and living off stored blubber reserves while migrating and in their winter range. The destruction or contamination of large numbers of euphausiid and copepod crustaceans (food of fin, blue, sei, humpback, and right whales), and the destruction of benthic amphipods (food of gray whales) would adversely affect associated whale species, possibly forcing them to enter their wintering areas with insufficient or lowered energy reserves. A major oilspill event impacting widespread areas would have to be sustained to significantly impact such mobile and far-ranging cetaceans in this manner. Catastrophic events affecting primary productivity of the

Portlock or Albatross Bank could possibly approach such proportions. Although such an event is very unlikely, any local or temporary contamination or chronic pollution resulting in destruction of plankton or other important food items would be an additional stress to an endangered whale population. The extent to which physiological stress resulting from oil pollution may affect endangered whales or interact with other stressors is highly debatable and any prediction of stress-related impacts of oil pollution on endangered whales would be premature.

Effects of Noise and Disturbance: Geraci and St. Aubin (1979) reported that high frequency sounds cause permanent ear damage in laboratory animals and could adversely affect marine mammals. However, low frequency sounds, such as those likely to emanate from drilling and platform operation, are much less destructive. Physical adverse effects from low frequency sounds on cetaceans are unknown; however, noise does have behavioral and physiological effects on birds and other mammals (Fletcher, 1971). Response of animals to acoustic stimuli have generally shown variance in behavioral and physiological effects dependent on species studied, characteristics of the stimuli (e.g., amplitude, frequency, pulsed or non-pulsed), season, ambient noise, previous exposure of the animal, physiological or reproductive state of the animal, and other factors.

Research on effects of noise, particularly that associated with oil operations on cetaceans has been limited. Field observations of responses of cetaceans to disturbance which presently exist provide some index of sensitivity of whales to noise and disturbance. For example, in respect to the gray whale in southern California, Dohl, et al. (1978) concluded "the reasons for this apparent increase in utilization of offshore waters are unknown, but might be the result of increased human activity in the Bight, increased gray whale numbers, or some combination of both factors." There are no confirmed reports or documented evidence of the latter species actively and consistently avoiding exploratory or production platforms, helicopters, seismic operations, or other OCS activity; in fact, numbers of gray whales nearshore along the California coast have remained relatively stable in spite of human activities (including oil exploration) (personal communication with T. P. Dohl, University of California at Santa Cruz, 1980). Geraci and Smith (1979) concluded that species such as the gray whale seem to co-exist well with human activities and most animals become accustomed to low level background noise such as tjat associated with most ship traffic and petroleum activities.

On the other hand, cetaceans may respond to and avoid sources which produce sudden, variable pulsed, and/or high amplitude noise. Gregarious toothed whales typically respond to sudden disturbance by sounding, dispersion, and regrouping (Geraci and St. Aubin, 1979 in reference to Leatherwood, 1977). Fraker (1978) observed both aircraft and boat disturbance of beluga whales, a species which may be sensitive to certain types of human activity. Leitzell (1979) concluded that "uncontrolled increase of vessel traffic, particularly of erratically travelling charter-use/pleasure craft, probably has altered the behavior of humpback whales in Glacier Bay, and thus may be implicated in their departure from the bay the past two years." Other evidence of humpback sensitivity to disturbance has been reported in its wintering grounds (Norris and Reeves, 1978). However, Payne (1978) listed numerous instances of apparent insensitivity of humpback whales to noise. Probably of major significance is interaction of noise with other visible phenomena or previous experience in

existing habitats as a result of facility siting, transportation corridors, shoreline alteration, dredging and filling, and other secondary development could occur. Significance of such impacts would vary by species, locale, and the extent of incremental losses elsewhere. Potential development near Talnik Point and Marmot Bay and pipeline construction in Kupreanof Strait may be of significance in terms of temporary or permanent, localized, indirect impacts on cetaceans.

Cumulative Effects: For the purpose of this discussion, "cumulative effects" refers to the sum of direct and indirect oilspill effects (e.g. direct mortality, reduction of food sources), disturbance effects, and other types of degradation which may reduce habitat quantity or quality. Such effects are assumed to be similar qualitatively to those discussed previously in section IV.A.2. Factors which may produce overall cumulative effects on endangered and non-endangered cetaceans include petroleum-related development such as the previous lower Cook Inlet oil and gas lease sale, other proposed and existing oil and gas lease sales, and existing tankering. Also the Beluga coalfield project, construction of the Pacific LNG plant, Homer harbor and fisheries industry expansion, other small boat harbor expansions (sec. IV.A.1.h.), and other changes in marine transportation systems could produce cumulative effects.

Oilspill risks analyses (appendix D, table 8, areas B, C, D) show high probability of spills contacting nearshore areas on the eastern Kenai Peninsula, Barren Islands, and northern Kodiak Archipelago (25%, 39%, 68%; respectively) as a result of simulated proposed (if production phases are realized) plus existing production activity. Cumulative spill probability is particularly high in Kamishak Bay (Augustine Island-Cape Douglas), shown at 77 percent chance of contact over the life of the field (appendix D, table 8, area H). Land segments on eastern Shelikof Strait shorelines identified as locales frequented by fin and gray whales show moderate to high (appendix D, table 14, no. 12) probabilities of spill contact over the life of the field as a result of simulations of the proposed sale plus the existing lease area. Appendix D, table 23, shows that the eastern Kenai Peninula, Barren Island, and northern Kodiak Archipelago areas have 21 percent, 18 percent, and 20 percent probability of contact by oilspills, respectively, from existing tankering of oil which is not production from Federal lease sales. Kalgin Island (noted for beluga whale occurrence) is presently subject to a high (24%) chance (appendix D, table 25, no. 64) of spill contact due to existing tankering. Land segments bordering Kennedy Entrance and those adjacent to the Barren Islands show a low to moderate probability of contact from spills due to existing tankering (appendix D, table 25, nos. 79-82). It can be concluded that spill probability as a result of existing tankering is already relatively high for certain areas frequented by cetaceans, particularly the eastern Kenai Peninsula, and northern Kodiak Archipelago. As would be expected, and as shown in appendix D, table 20, cumulative probabilities of the existing lease sale, proposed sale, and existing tankering together would be very high for the eastern Kenai Peninsula, Barren islands, northern Kodiak Archipelago areas, Kalgin Island land segments (appendix D, table 21, no. 64), and shores of Kennedy Entrance (appendix D, table 21, nos. 79-82). Oilspill risk analyses utilized herein do not lend themselves to evaluation of cumulative effects on areas such as the Portlock Banks. However, it is possible that cumulative oilspills on the Portlock and Albatross Banks whale feeding areas could be sustained and result in decreased planktonic productivity (e.g. have indirect impact on cetaceans), particularly if proposed sale 61 or Bering Sea sales would be developed to

production phases. Ultimate effects (e.g. food source losses) of cumulative spills due to the proposed and existing sales are probably minor in regard to overall endangered whale population response, assuming major negative impacts are not sustained elsewhere in the ranges of various species. Since it is unknown how extensive oil and gas development would be in other proposed sale areas, it is impossible to predict at this time the future cumulative oilspill related effects on endangered or non-endangered cetaceans associated with such proposed sales. If several proposed sales were to yield large discoveries of oil and gas, intensive production activities and resultant increases in human activity, increased localized or shipping corridor disturbance, increased pollution, or other negative effects; cumulative oilspills or disturbance could be significant for coastal species such as humpback or gray whales. Similarly, less intensive but more widespread oil production-related effects distributed throughout a species range may be significant, particularly to various sensitive species. Such species may include severely depleted and slow to recover stocks such as humpback or right whales.

Although a major portion of local hydrocarbon input into marine environments could result from the proposed sale 60 and other lease sales, localized and regional hydrocarbon inputs from other sources (e.g., urban run-off, and other non-industrial sources, marine shipping) throughout their range may also impact cetaceans. The potential effects of other pollution sources on cetaceans are unknown.

Certainly of some concern regarding disturbance of cetaceans are the long-range effects of small boat and small harbor expansion which may be independent of OCS exploration and development. It is likely that increased small boat traffic associated with improved facilities and increased recreational traffic in lower Cook Inlet and the Kodiak area could have as much if not more potential for disturbance of cetaceans as industrial activity associated with oil and gas exploration. The extent to which future discovery of petroleum in the proposed sale area or Alaska in general would lead to increased recreational boat traffic is uncertain, but lower Cook Inlet and Shelikof Strait may show more use due to proximity to Anchorage. Beluga populations in Cook Inlet may be vulnerable to cumulative disturbance since they would be exposed to boating activity in the lower Cook Inlet as well as future expansion of marine transportation near Anchorage (e.g. possible trans-inlet ferry service).

Other sources of disturbance of cetaceans which may be as much or more influence than petroleum industry impacts, either directly or indirectly, on endangered cetaceans include disturbance associated with fishing vessels. The International North Pacific Fisheries Commission Statistical Yearbook for 1976 reported nearly 2,500 fishing vessels operating in 1975 in the northeast Pacific alone, an area representing only a portion of the range of most endangered cetaceans. Although probably not feasible to perform with any accuracy, the prediction of behavioral responses of cetaceans to acoustic perturbation of their environment ideally would also include an analysis of effects of such fisheries industry sources throughout their range. Due to present limitations, it is not possible to conclusively evaluate either long or short term cumulative effects of acoustic disturbance on cetaceans.

Unavoidable Adverse Effects: The degree of unavoidable impacts on endangered whales is unknown. Relatively high probabilities of spill contact with certain areas indicates that cetaceans or their habitats may be affected. Noise

and other forms of disturbance could cause at least temporary behavioral responses of cetaceans. Present knowledge of petroleum-related activity and its relationship to cetaceans is insufficient to predict with high confidence the unavoidable adverse effects on endangered and non-endangered cetaceans. However, it can be concluded that unavoidable adverse effects of exploration on endangered and non-endangered cetaceans are probably minor, and less than might be incurred during later phases of outer continental shelf development in the proposed sale area.

Endangered Species Consultation: Pursuant to requirements under the Endangered Species Act of 1973 as amended, Section 7 endangered species consultation of the Bureau of Land Management with National Oceanic and Atmospheric Administration/National Marine Fisheries Service has been conducted, and will continue to be conducted as required. In the biological opinion rendered by NOAA/NMFS (appendix H) it was concluded, "Based upon our knowledge of the biology of these whales, the broad distribution of most of these endangered whales, the relatively small area involved in the lease sales, the very low probability of a major oilspill during exploration...and the anticipated level of exploration activities..., NMFS concludes that the lease sale and exploration activities associated with lease sales 46, 55, and 60 are not likely to jeopardize the continued existence of any of the endangered whales or their habitats."

Impacts on Endangered Birds

The Aleutian Canada goose could be affected in modes similar to those described for marine and terrestrial birds (sec. IV.A.2.d).

The possible occurrence of the Aleutian Canada goose on the Semidi Islands does not appear to be sufficient indication of this species being within any reasonable zone of influence of the proposed lease sale. The oilspill risk analysis (sec. IV.A.1.d., and appendix D) indicates that the probability of a spill contacting the Semidi Islands is less than 0.5 percent assuming as much as a 30-day trajectory period. It is not expected that aircraft associated with the proposed sale will have any possible disturbing influence on these islands. Thus there is no evidence at this time to suggest any significant impact of the proposed sale or associated exploratory activity on this species. As discussed previously (section III.B.6), there are no other endangered avian species known to occur in the proposed sale area, and thus no impacts are expected on other endangered species.

Conclusion: It is possible that endangered and non-endangered cetaceans could sustain direct and indirect effects due to oilspill occurrence in areas of high risk of contact such as the northern Kodiak Archipelago, Kamishak Bay, and eastern Shelikof Strait. Cumulative probability of spills would be high in these areas. Localized effects of oilspills may be sustained in the vicinity of a tanker terminal located on the eastern side of Kodiak Island. Of all the alternatives, the proposal poses the most potential for disturbance of cetaceans from noise or other human activity. Therefore, it is possible that cetaceans would sustain negative, unquantifiable effects as a result of disturbance. There is no evidence at this time to suggest any significant impacts of the proposed sale on endangered birds.

Cumulative Effects: Cumulative oilspill effects of the proposed sale with other scheduled lease sales were considered. Potential oilspills resulting from proposed sale 60 plus the existing lower Cook Inlet lease sale, show little, if any, chance of hitting the Semidi Islands. There seems little possibility that this sale would contribute in a significant way to any other potential impacts on Aleutian Canada geese (e.g. disturbance) which may be associated with other proposed sales or projects.

Unavoidable Adverse Effects: There would be no unavoidable effect on the Aleutian Canada goose.

Endangered Species Consultation: As a result of the above summarized analysis and informal consultation with appropriate personnel of the United States Fish and Wildlife Service, it has been concluded that formal consultation under section 7 of the Endangered Species Act is not necessary at this time in regard to impacts of the proposed sale 60 on endangered birds.

g. Impacts on Terrestrial Mammals: Of the approximate 38 species of terrestrial mammals that occur in the lower Cook Inlet and Shelikof Strait, the following species could be affected to some degree by oil and gas development activities in the proposed sale area: river otter, brown and black bear, red and arctic fox, wolf, coyote, mink, wolverine, moose, and black-tailed deer.

In general, the effects of oil pollution on most terrestrial mammals would result from oil contamination of coastal habitat, and contamination or reduction of food sources. Sitka black-tailed deer and moose rely on coastal areas for winter foraging. The deer depend primarily on sedges and kelp along the coastal beaches during severe winters. An oilspill along the beaches could destroy this food source or render it unpalatable. Oil contaminated vegetation may take several years to reestablish. Black bear and especially brown bear depend on coastal streams, beaches, and river mouths for salmon and other food. Oilspills that reduce salmon populations would have a negative effect on brown bears in the area, especially the Kodiak National Wildlife refuge population which relies primarily on the abundant salmon for its existence.

Other furbearers such as mink, wolverine, fox, coyote, wolf, and river otter utilize coastal beaches for feeding and movement. Oil contamination of the beaches could destroy important food sources and expose these furbearers to direct oiling and oil ingestion through contaminated food. River otters are probably the most vulnerable of the above species to direct oiling. They are probably as sensitive to oiling as are sea otters (sec. IV.A.2.e.). They swim and forage in coastal waters and are more likely than other terrestrial mammals to be heavily coated by an oil slick. Death due to oiling could result.

The oilspill analysis indicates (sec. IV.A.1.d. and appendix D) that some coastal habitat areas along Shelikof Strait on the Alaskan Peninsula; Afognak, Raspberry, and Kodiak Islands; and Kamishak Bay are at comparatively high risk of being contacted by an oilspill in the proposed lease area. For example, the Alaskan Peninsula area from Kukak Bay south to Kinak Bay (land segment 45 table 14) has a high probability (31%) of being contacted by an oilspill within 10 days (appendix D, table 14, no. 45). The southwestern Afognak coast from Malina Bay south to Kupreanof Strait has a 23 percent probability of being hit by an oilspill. Bruin Bay (contact point in Kamishak Bay, appendix

D, table 14, no. 54) has a 12 percent chance of being hit by an oilspill within 10 days. Brown bear spring coastal beach concentration and stream use areas in Bruin Bay, and Kukak Bay (graphic 9) are at moderate to high risk from potential oilspill contacts (appendix D, table 14, no. 45). Sitka black-tailed deer winter foraging areas (graphic 9) on Raspberry Island, Kupreanof Peninsula, and Uganik Island southwest to Cape Kuliuk have a moderate (11-20 percent) to high (72%) probability of being contacted by an oilspill (appendix D, table 14, nos. 14 and 25).

The proposed development scenario involves the construction of an underwater pipeline from the Shelikof Strait tracts and a 10 mile onshore pipeline from Chernof Point to Talnik Point and a 70-mile onshore gas pipeline from Anchor Point to Nikiski (sec II.B.1.a.). The pipelines and proposed tanker facilities at Chernof Point would utilize 120 acres for a terminal facility, and 5750 yd^3/10 miles for an oil pipeline and 2377m^3/km for gas pipeline. This amounts to alteration of terrestrial mammal habitat within the Whale Passage-Talnik Point area and on the Kenai Peninsula. Alterations to the terrestrial habitat can have a negative (disturbance-bears) or positive effect (create edge-plant diversity) on deer, moose, and other species. In any case, these habitat changes would have minimal long-term effects on deer and other terrestrial mammals.

Conclusion: Possible oil contamination of coastal beaches from large and chronic oilspills could have negative effects on terrestrial mammals, notably brown bear, moose, black-tailed deer, and river otter. Onshore pipeline construction and the establishment of tanker facilities would temporarily displace some terrestrial mammals, such as bears, and could positively affect others, such as deer and moose. The proposed actions would have minimal to moderate impacts on some terrestrial mammal populations of the above species in the Shelikof Strait and lower Cook Inlet regions.

Cumulative Effects: The combined effects of the proposed actions, the existing lower Cook Inlet lease area, existing hydrocarbon tankering, and other planned development projects (sec. IV.A.1.h.) may increase the risk of adverse impacts on terrestrial mammals and their coastal habitats within the lower Cook Inlet and Shelikof Strait regions. The cumulative increase in human populations due to OCS activities, and other development projects may increase recreational use of terrestrial mammal populations. Hunting pressures would likely increase, as well as other recreational-related disturbances and harassments of terrestrial mammals and their habitats. Some species, such as brown bear and wolf populations, may be displaced, and some populations could decline for an indefinite period of time. What that means in final populations numbers cannot be assessed at this time.

Unavoidable Adverse Effects: A certain number of animals, such as brown bear, may be displaced by onshore pipeline construction and shore facilities development. This displacement would likely be temporary along the pipeline route. Oilspill contact at beaches and estuaries could result in contamination of some terrestrial mammal food, such as kelp consumed by deer, and oiling of some mammals, such as river otter, mink, and fox, that forage along the beach or swim in nearshore waters. However, these occurences would be infrequent and the number of terrestrial mammals involved would be few. Overall, unavoidable impacts would likely to be minor.

h. Impacts on Social Factors:

(1) Impacts on Population: The following discussion focuses first on the communities of Kodiak and Port Lions, then turns attention to the communities of Kenai, Soldotna, and Homer. First, population forecasts are presented, then in section IV.A.2.h.(2) sociocultural system impacts are predicated on these forecasts.

Population forecasts for alternative I are presented in tables IV.A.2.h.(1)-1, -2, -3, and -4. For a more detailed discussion, the reader is referred to Alaska Consultants, Inc., 1979 and 1980.

Kodiak: Under the base case, population in Kodiak is forecast to increase from 4,818 in 1980, to 10,229 in the year 2000, at an average annual rate of increase of 5.6 percent. With this alternative the population increases at an average annual 6.1 percent to a total of 10,674 by 2000. Assuming that a construction workforce to construct facilities in the Kodiak and Port Lions areas would be separate from the downtown Kodiak area, OCS-related resident employment in the table IV.A.2.h.(1)-1 excludes this construction workforce. OCS-related resident employment is thus assumed to begin in 1982 with slightly under 100 residents in 1986 and fluctuating between 300 and 400 OCS-related residents during the 1986-1989 period. From 1990 through 2000, OCS production employment and population would increase to a predicted 420 to 445 new residents for the Kodiak area, associated with terminal facilities located at or near Port Lions and service base facilities provided somewhere in the Kodiak road-connected area.

Port Lions: The current population of Port Lions is projected under base case (without OCS) assumptions to grow at an average annual rate of 4 percent per year to a total of 481 by the year 2000. With OCS development and a potential terminal in the vicinity, this growth rate accelerates to 7.2 percent over the 1980-2000 period yielding a population of 648 by the end of this century. Construction work force prior to 1986 is assumed to be enclaved in the Kodiak-Port Lions area to construct the Port Lions terminal facility, any service base needed for Kodiak offshore support and for pipeline construction.

Kenai-Soldotna Area: Under the base case, population in the Kenai/Cook Inlet Census Division is forecast to increase from 24,012 in 1980 to 41,382 in the year 2000. For the Kenai and Soldotna areas, population is projected to increase from 4,714 in Kenai, 2,538 in Soldotna, and 7,252 in the remaining Kenai/Soldotna area in 1980, to 6,932 in Kenai, 4,622 in Soldotna, and 11,554 in the remaining unincorporated area by the year 2000. See table IV.A.2.h.(1)-3.

Under the mean find scenario, the population allocated to both Kenai and Soldotna during the 1982-86 period ranges from a low of 17 in 1982, to a high of 84 in 1968, an insignificant impact for either community. With completion of facilities, presumed to be located in the Homer area, the population allocated to both Kenai and Soldotna rises to 151 in 1987, to 184 in 1990, and then stabilizes at about 170 from 1990 to 2000. Assuming 3.2 persons per household for this area (Anchorage Urban Observatory, 1977) on the average, this would mean between 45 and 60 new families would need to be accommodated in the communities of Kenai and Soldotna.

Table IV.A.2.h.(1)-1
Forecast of Non-OCS Employment and Population:
Kodiak Area and Remainder of Kodiak Census Division
1980-2000

	1980	1985	1990	1995	2000
Total Employment	6,349	8,100	9,163	10,094	10,628
Ratio of Population to Employment	1.71	1.71	1.71	1.78	1.83
Total Population Kodiak Census Division	10,856	13,851	15,558	17,967	19,556
City of Kodiak Coast Guard Remaining Road-Connected Areas	2,409	3,349	3,390	4,626	5,115
Remainder in Census Division	1,129	1,305	1,377	1,588	1,712

Source: Alaska Consultants, Inc., (1979); Technical Report No. 40, Table 14

Table IV.A.2.h.(1)-2
Kodiak Census Division Mean Find
Scenario Impacts: Population Allocated to Kodiak
City and Port Lions

Year	Total Employment	Total Population	Kodiak	Port Lions
1980	---	---	---	---
1981	---	---	---	---
1982	96*	179	179	---
1983	58	108	108	---
1984	70	130	130	---
1985	41*	76	76	---
1986	261*	485	318	167
1987	303*	564	397	167
1988	290	539	372	167
1989	284	528	361	167
1990	316	587	420	167
1995	320	595	428	167
2000	329	612	445	167

Source: Table IV.A.2.i-2, Employment: Kodiak Census Division, Mean Find Scenario. Dependency ratio used is 1.86 allocated to Kodiak and Port Lions as with employment.

* Excludes construction employment.

Table IV.A.2.h.(1)-3
Forecast of Non-OCS Population
Kenai-Cook Inlet Census Division and
Cities of Kenai, Soldotna, and Homer
1980-2000

Year	Non-OCS Population					Total Non-OCS Population
	City of Kenai	City of Soldotna	Remaining Kenai-Soldotna Area	City of Homer	Remaining Homer Area	
1980	4,714	2,538	7,252	2,087	3,004	24,012
1985	5,114	3,003	8,117	2,909	3,415	27,582
1990	5,467	3,644	9,111	3,932	3,931	31,779
1995	6,145	4,098	10,245	4,614	4,614	36,225
2000	6,932	4,622	11,554	5,429	5,428	41,382

Source: Alaska Consultants, Inc., (1980); Technical Report 46, Volume 2, Tables 2, 3, and 4.

Table IV.A.2.h.(1)-4
Kenai/Cook Inlet Mean Find Scenario
Impacts: Population Allocated to Kenai-Soldotna Area
and Homer Area

Year	Total Population	Kenai	Soldotna	Kenai-Soldotna Area	Homer	Homer Area
1980	---	---	---	---	---	---
1981	---	---	---	---	---	---
1982	134	17	17	33	34	33
1983	216	27	27	54	54	54
1984	221	28	28	56	56	56
1985	166	21	21	41	41	42
1986	671	84	84	168	168	168
1987	1207	151	151	301	301	302
1988	1401	175	175	350	350	350
1989	1412	176	176	352	352	352
1990	1475	184	184	368	368	368
1995	1362	170	170	340	340	340
2000	1389	174	174	348	348	348

Source: Table IV.A.2.i-3, Employment Kenai/Cook Inlet Mean Find Scenario. Dependent ratio used is 1.86 population is allocated as follows: 50 percent to upper Cook Inlet, 50 percent to lower Cook Inlet; within the Kenai-Soldotna area, 25 percent to Kenai, 25 percent to Soldotna, and 50 percent to the surrounding unincorporated area. In the lower Peninsula, 50 percent of population is allocated to Homer and 50 percent to the Homer-Anchor Point area.

Homer Area: Homer area population in the base case rises from 2,087 in 1980, to 5,429 in 2000, for an average annual rate of 8.4 percent. This relatively rapid rate of growth is largely the result of Homer's expanding fishing and tourism-recreation sectors, and assumed expansion of bottomfishing activity there. Another factor included in the base case for Homer is Homer's role as an OCS service base for lower Cook Inlet OCS exploratory activity.

With this alternative, Homer area population is forecast to increase by 67 new residents in 1983, rising to slightly over 100 residents in 1982-84. From 1987 through the year 2000, resident population associated with operation of both an oil storage and tanker loading terminal and a gas compressor station would increase to over 600, with one-half assumed to reside in the Homer city limits, and another half assumed to reside in the area surrounding Homer. See table IV.A.2.h.(1)-4.

Conclusion: Base case population in Kodiak increases at an average annual increase of 5.6 percent between 1980-2000, compared with 6.1 percent under the proposal. In Port Lions the average annual rate of growth nearly doubles, from 4 percent in the base case to 7.2 percent under the proposal. In Kenai and Soldotna the change in average annual rate of growth with the proposal is neglibible. In Homer, average annual growth from 1980-2000 is 7.6 percent under the base case and rises to 8.48 percent under the proposal.

If population increases allocated to Kodiak by modal projections are in fact absorbed by Port Lions, population impacts on Port Lions would more than double, which is a major impact. Even with the smaller projected population, the community of Port Lions can anticipate increased pressure on fish and wildlife resources, short-term environmental degradation, increased noise, and other disturbances related to increased population. Secondary population accompanying oil workers may also increase competition in Port Lions, Kodiak, Homer, Kenai, and Soldotna for other local jobs, while at the same time stimulating expansion of the economy of these towns. Oilspill effects on local resources are discussed in section IV.A.2.h.(3) and sociocultural impacts of population increases are discussed in section IV.A.2.h.(2).

Cumulative Effects: The cumulative population case has already been discussed in comparing the proposal with base case projections per community.

Unavoidable Adverse Effects: Unavoidable adverse effects would include increased pressure on fish and wildlife resources, particularly in the Kodiak, Port Lions, and Homer areas, increased competition for local jobs, particularly in Port Lions and perhaps in Homer, and some environmental degradation and deterioration of the present quality of life during the construction period, particularly in the Port Lions and Homer areas.

(2) Impacts on Sociocultural Systems:

Kodiak City: While the incremental increase in OCS-related population over the period is less than 1 percent per year of Kodiak's forecasted base population, the perceived competition between OCS activities and the fishing industry for housing, support personnel, wholesale and retail trade, community and governmental services, transportation and communications suggests that even these relatively small population changes would be perceived in Kodiak as major impacts. Because of these potential conflicts, any expansion of OCS

support for exploration and/or development would require certain understanding of the Kodiak community and its dynamic maritime adaptation to be successful. Careful planning and coordination with the OCS Advisory Council, the Kodiak Island Borough, and other local Kodiak institutions would be critical to establishing a successful relationship between the petroleum industry and Kodiak residents.

Since Kodiak fishermen fish the entire island, an oilspill along Shelikof Strait could have a major impact on Kodiak city and its maritime adaptation. Direct damage to the fishing environment could directly effect the fishing industry which, in turn, would directly disrupt Kodiak's economy and sociocultural system. Oil on crab gear, set gillnets, purse seines, and trawls would have economic impacts, requiring expenditures by fishermen for cleanup, repair, and/or replacement. Compensation for oil-related damage to fishing gear and loss of profits from such damage is provided for through the Fishermen's Contingency Fund (appendix G) or the Offshore Oil Pollution Compensation Fund (appendix F). Reduced catch levels, fish and shellfish contamination, and its effect on marketability of these products, potential disruption of fishing activities during oilspill cleanup, diversion of commercial air service, and Coast Guard support in the event of an oilspill could each independently effect the sociocultural system of Kodiak. The degree of impact on the environment, and hence, to the Kodiak fishing industry of a major oilspill, if one were to occur, is difficult to project.

Another perceived negative impact of OCS development on the city's sociocultural system involves the possible shift of workers from cannery employment to OCS-related work. Given the relatively low wages within the fishing industry for cannery workers, it is likely that some permanent residents of Kodiak would seek employment in the construction phase of any service base constructed on Kodiak Island, and with training, might be encouraged to seek permanent employment associated with OCS activities. It is extremely doubtful, however, that a significant fraction of the cannery work force would be diverted, particularly given the specialized character of OCS-related work and the continued reliance on west coast labor pools for additional cannery support.

Conflict between Kodiak's Native residents, village residents, and newer ethnic minorities within Kodiak such as the Filipinos, Vietnamese, and the Koreans, could be heightened if significant additional work related to OCS were to become available, and if ethnic and Native organizations were encouraged by these opportunities to actively champion their interests of their members. Again, the specialization of the permanent OCS work force argues against a significant permanent dislocation of the sociocultural system. During construction of permanent facilities, however, it is likely that competition for construction jobs could cause conflicts both within the fishing industry and between minority populations dependent upon the fishing industry.

Competition between OCS activities and the fishing industry for government support, restaurants, bars, and other recreational opportunities, temporary housing, wholesale and retail trade, and commercial air support are all potential sources of conflict if communication channels between the oil industry and the predominant fishing community are not maintained and if shortages occur in any of these services. The expanding fishing industry has already contributed to strain on or shortages of some services. Given the normal economic forces, however, it is likely that shortages in any of these services

would be accompanied by expansion to meet demand, with only temporary dislocations likely. Given the oil industry's long experience in frontier areas and the tendency of the industry to supply its own needs, these dislocations would likely be minor.

Payne (1980) suggests that an infusion of job seekers into Kodiak in anticipation of OCS construction can be expected to accompany any lease sale decision in the area. Given the low probability of recoverable oil and present support services already in place in Seward and Kenai-Nikiski, it is unlikely that this potential problem would occur until and unless a major oilfield were successfully tapped. If significant recoverable oil were discovered during exploratory drilling and if a decision to move toward production of this oil were made which included facilities on Kodiak Island, then this could be a significant sociocultural impact. Even with this eventuality, however, the community of Kodiak can anticipate at lease five years lead time in which to prepare media campaigns or other methods of discouraging such an influx.

Crime rates of alcohol abuse, and other measures of conflict could occur depending on several conditions. First, the number of immigrant job seekers would affect rates of conflict. Second, the degree of isolation of construction personnel during the peak construction period, could influence these rates. If rules of conduct were established prior to a construction phase and enforced through industry-community agreement, and if other anticipatory industry-community planning were to occur, many of these potential conflicts could be mitigated.

Port Lions: For a community the size of Port Lions, the impacts and changes resulting from the proposal could be substantial. Not only would the community grow at close to twice its average annual rate of growth, but the structural changes introduced by location of a terminal facility in the city or nearby Native-owned lands would add a permanent work force and families tied to the oil industry or a new subpopulation to the town's melding of Aleut and independent fishing lifestyles. While this change would involve a fundamental alteration in many of the characteristics of the present village of Port Lions, there are social characteristics of the town's recent past which suggest it could respond favorably to these changes and might in fact welcome them. The Good Friday earthquake of 1964 resulted in the relocation and renaming of Port Lions. The community has successfully adapted to these changes. Second, efforts over the past few years to attract a cannery to replace the Port Wakefield Crab processor have been so far unsuccessful, encouraging relatively active recruitment of new industrial opportunities for the area. Third, the legacy of the Port Wakefield cannery as an innovator in the crab processing industry and the relocation of the orginal village of Afognak which had prospered on Afognak Island from the earliest Russian contact period, appears to have created an energetic social system well adapted to the demands of another fundamental change. Talks locally with a crossection of Port Lion's citizens suggest that the town would respond well to a change of this magnitude. Like the community of Old Harbor across the island, Port Lion's successful adaptation after the earthquake disaster appears to have added a resiliance to its population which encourages positive response to other changes (Davis, 1980).

Shelikof Strait Villages: Given the nature of the villages of Karluk and Larsen Bay and their distance from potential activity associated with this

proposal, it is unlikely that major disruption of their sociocultural systems would occur unless a major oilspill affected their resource base. Like fishermen in Kodiak, residents of Larsen Bay and Ouzinkie, in particular, would be directly affected by an oilspill which reduced catch levels, contaminated local fish and shellfish stocks or the food on which these stocks depend, disrupted fishing activities during oil cleanup operations, or diverted commercial air service or Coast Guard support. These direct effects would be in addition to the effects on subsistence resources and lifestyles analyzed in section IV.A.2.h.(4). Clearly, the effects of an oilspill on both commercial and subsistence resources would be a significant impact on all of these villages.

During the construction phase of this proposal, it is likely that some local residents of these villages would seek construction employment, temporarily leaving their village during the construction season. Given the highly specialized nature of the oil industry and normal family-oriented preferences of village residents, it is unlikely that the number of residents per village and their length of stay outside the village would be great over the life of the project. During construction, villages might be forced to reallocate responsibilities temporarily if key resident individuals seek employment elsewhere. On the other hand, if training programs were instituted which encourage Native hire, there could be a depletion of key village residents from other Shelikof Strait villages to operate the hypothesized terminal near Port Lions. While this was expressed as a concern in these villages, the history of permanent long-term job shifting on the Trans-Alaska Pipeline project suggests that most Native employment on this project was relatively short-term employment or occurred under minority subcontracts during construction of the pipeline facilities (Baring-Gould and Bennett, 1975; Record, 1978; Strong, 1977).

Kenai-Soldotna Area: From the standpoint of the sociocultural systems of Kenai and Soldotna, an additional 45 to 60 families per community is not a significant impact, particularly since these additional residents would be engaged in work already prevalent in the area. The additional population resulting from the proposal would not form a distinct subgroup within either community, but would enter communities already accustomed to the oil and gas industry. The pattern of settlement in both of these communities has encouraged dispersion of families along major highways; this pattern in itself suggests the ready absorption of this new population.

One effect of additional population in these communities might be increased pressure on local fish and game. This impact should be minor under this alternative.

Homer Area: This alternative implies a minor impact on the Homer area's sociocultural systems. The political and social conflicts already inherent in Homer's present response to current OCS exploration under sale CI leases would most likely become even more intense. Conflict over use of Homer Spit, over environmental degradation, and oilspill contingencies would likely intensify, as would conflicts between environmentally oriented Homer residents and newer oil industry associated residents. As long as the number of oil-related workers remained small, as has been the case with exploratory drilling with sale CI, these internal conflicts concerning the direction of the community and its predominant lifestyles would remain relatively minor. Yet even with relatively inobstrusive exploratory drilling in effect with sale CI activity (7 exploratory wells in 3 years) Northern Resource Management reports 96

separate news items, editorials, or letters to the editor in Homer concerning OCS during the year 1977 alone. This compares with only 6 comparable newspaper items in the local Kenai paper for that same year (Northern Resource Management, 1980, pp. 140-160). This newspaper analysis is indicative of the highly charged climate of public opinion in Homer concerning oil-environment interactions, benefits, and costs.

While the Northern Resource Management study suggests that shipping lanes initiated during 1978 alleviated many of the earlier conflicts between fishermen and OCS support traffic, one could expect other issues and conflicts to arise with this proposal. Of critical importance, however, is the extent of recoverable oil found. If economically recoverable oil or gas is found, and expanded facilities are constructed in the Homer area, these conflicts would intensify.

Conclusion: This proposal could result in the following impacts on Kodiak's sociocultural systems: 1) short-term loss of cannery workers to OCS employment, 2) possible conflict between island residents over OCS-related jobs, 3) short-term competition between the petroleum and fishing industries over available goods and services, 4) influx of population, particularly industries in Port Lions, leading to strains on community infrastructure (see sec. IV.A.2.h.(3)), and 5) increased crime and other social conflict, and alcohol abuse.

The Shelikof Strait villages of Karluk, Larsen Bay, and Ouzinkie can be expected to experience minor loss of resident workers during the construction phase of the proposal. If a major oilspill were to occur along Shelikof Strait, both commercial and subsistence resources and fisheries would be adversely affected. Temporary relocation of air service during expansion of OCS activities, or in the event of a major spill might also create hardships for these villages.

Impacts on the sociocultural system of Kenai, Soldotna, and the Kenai/Soldotna area would likely be minor.

In Homer, conflicts over the direction of the community, the use of the spit, and industrial versus self-reliant, non-industrial lifestyles could intensify, particularly if development occurs and two new major facilities are constructed in the Homer area (see sec. IV.A.1.h.). An oilspill in the Homer or Kenai areas could also have widespread affect on fisheries and fishermen (see secs. IV.A.2.b. and c.), and could therefore indirectly affect the sociocultural systems of these communities.

Impacts on English Bay and Port Graham are discussed in section IV.A.2.h.(4) (Impacts on Subsistence). Sociocultural impacts on these villages and on the communities of Seldovia, Ninilchick, and other smaller communities of Cook Inlet would probably be minor.

Cumulative Effects: The most important sociocultural cumulative impacts are those which may occur as a result of lease sale CI. The effects of this sale and exploratory drilling already occurring on tracts leased for sale CI are discussed above. Small boat harbor and fisheries expansion are assumed in base case population projections for Homer and Kodiak, and Pacific LNG plant expansion is included in base case population projections for Kenai/Soldotna. The Beluga Coalfield development on the west side of Cook Inlet could intensify subsistence-recreational hunting and fishing conflicts, particularly for the village of Tyonek (see Brown and Behnke, 1980).

Unavoidable Adverse Effects: Unavoidable adverse effects would occur in the city of Kodiak in the form of increased crime and intensified competition for OCS-related construction jobs. Workers may be drawn to OCS activities from Kodiak Island villages. Such an emigration would disrupt the sociocultural systems of these villages. Given the probability of oilspills occurring as a result of the proposal (sec. IV.A.1.d.), it is likely that at some time during the life of the proposed action, the sociocultural systems would be adversely affected. The degree of impact on sociocultural systems would depend on the extent of damage to commercial and subsistence resources upon which most village residents depend.

(3) Impacts on Community Infrastructure (Kenai, Homer, Kodiak, and Port Lions Areas): This has been identified as a major scoping issue (sec. I.F.). The local areas likely to be affected by the proposed sale are the Kenai, Homer, Kodiak, and Port Lions areas. Tables IV.A.2.h.(1)-1 through -4 show the population growth expected to result from the proposed lease sale for these areas. In general, infrastructure requirements are directly related to population growth. The reader is referred to section IV.A.2.h.(1) for a detailed discussion of population projections for the proposal.

Kenai Area: Population growth resulting from the proposed lease sale in the Kenai area is considered insignificant. The average annual growth rate in Kenai is forecast to increase by .0018, and in Soldotna by .0034. This increase would cause no additional strain on community infrastructure requirements over and above those experienced in the base case. The reader is referred to section III.H.2. for a complete discussion of the base case forecast for infrastructure requirements.

Homer Area: Population growth expected to result from the proposed lease sale in the Homer area is considered insignificant. The average annual growth rate in Homer is forecast to increase by .0034. This increase would cause no additional strain on community infrastructure requirements over and above those experienced in the base case. The reader is referred to section III.H.2. for a complete discussion of the base case forecast for infrastructure requirements.

Kodiak Area: Population growth expected to result from the proposed lease sale in the city of Kodiak area is considered insignificant. The average annual growth rate in the city of Kodiak is forecast to increase by .0045. This increase would cause no additional strain on community infrastructure requirements over and above those experienced in the base case. The reader is referred to section III.H.2. for a complete discussion of the base case forecast for infrastructure requirements.

Port Lions: Population growth expected to result from the proposed lease sale in the Port Lions area is considered substantial. The average annual growth rate in Port Lions is forecast to increase by .0314. This increase would cause considerable strain on community infrastructure requirements over and above those experienced in the base case. This is of particular concern given that a significant increase in population would occur in 1986 (see table IV.A.2.h.(1)-4).

The most significant concern is the shortage of available housing. Under the base case, the community is forecast to experience a housing shortage by the mid-1990's. Under the proposed lease sale, this shortage would occur much sooner, in the mid-1980's. There is virtually no housing available to immigrants to the community. The housing stock could be expanded to accomodate the forecasted expanded population. However, such an expansion concurrently demands expansion of other services such as water, sewer, electrical power, police, and fire protection. If oil terminal facilities were annexed to Port Lions, the community's tax base would likely expand so that the community could cope with this rapid expansion of services. Of significance, however, is the time lag between demand for the expanded services and the revenues generated from the new tax base.

The community, itself, has expressed a desire to attract industry. Furthermore, the community has demonstrated an ability to attract financial resources for expansion when required. Given this combination, it can be assumed that Port Lions could effectively deal with the forecasted growth.

Conclusion: Insignificant impacts would occur to the Kenai area, Homer area, and Kodiak area under the proposed lease sale. The Port Lions area would experience substantial growth under the proposed lease sale; however, the community's desire to attract industry and its demonstrated ability to attract financial resources indicate that impacts would not be adverse or undesirable.

Cumulative Effects: Cumulative effects resulting from the proposed lease sale and other projects (described in sec. IV.A.1.h.) would occur only in the Kenai and Homer areas. Minor impacts could be expected in Kodiak and Port Lions.

Unavoidable Adverse Effects: It seems likely that no unavoidable adverse impacts on community infrastructure would occur as a result of the proposed lease sale. The reason for this is that additional growth requirements in the Kenai, Homer, and Kodiak areas resulting from the proposed sale are considered insignificant and the growth in Port Lions is considered by many to be desirable.

(4) Impacts on Subsistence: According to Alaska statutes, "subsistence uses" are those customary and traditional uses in Alaska of wild renewable resources for direct personal or family consumption (AS, sec. 16.05.940). Graphic 14 indicates the primary subsistence use area for the villages of Karluk, Larsen Bay, Ouzinkie, Port Lions, English Bay, and Port Graham. Subsistence areas for the first three villages were defined by village residents of the Shelikof Strait villages themselves in consultation with Alaska OCS Office and Kodiak Area Native Association staff. For English Bay and Port Graham, approval to use information collected by North Pacific Rim, Inc. was obtained from the councils of the two villages. In each case, village council approval and support was obtained before the information was mapped.

Tables III.C.1.d.-1 and III.C.1.d.-2 on the back of graphic 14 indicate the primary subsistence species used by residents of each of the four villages along Shelikof Strait, as well as by English Bay and Port Graham residents in Cook Inlet. Halibut, at least three species of salmon, flounder, trout, cod, crab, clams, seal, sea lion, ducks, deer, ptarmigan, and rabbit are primary species on which these villages depend.

Primary subsistence species are those resources that contribute substantially to family diet, are important cultural elements both as foods for important community events, and as activities around which family and community life are centered and organized. Primary subsistence resources are not only essential to the daily life and diet of resident villagers, but they provide the economic security normally associated with money in a cash economy.

While considered "secondary" resources, or less central diet elements from the point of view of either weight, amount harvested or yearly catch, most secondary resources of these villages back up primary resources used and provide nutritional variety and balance to local families. The small "bidarky" or sea urchins, clams, and octopus, for example, are all delicacies which are highly prized and shared widely throughout the community through informal visiting and at feasts. While perhaps not essential nutritionally, these foods are important elements of cultural tradition and are frequently referred to by their Aleut-Russian names, even by residents who speak English.

Another characteristic of secondary resources is their availability during periods of scarcity of primary resources. During these times, secondary resources may be utilized more heavily, in fact, supplant scarcer primary resources. In English Bay, for example, residents now utilize a wider range of fish from the area as game has become more scarce. Similarly, sport fishing pressure on silver salmon in the Kodiak area has reduced this species' use as a primary subsistence resource in both Port Lions and Ouzinkie, forcing greater utilization of pink salmon by these villagers.

Secondary resources for the villages along the Shelikof Strait include less plentiful salmon species, herring, fish eggs, octopus, "beach food," tanner crab, bird eggs, and locally available wild vegetables and berries. Secondary resources in English Bay and Port Graham include less plentiful fish species, fish eggs, less plentiful crab species, sea lion (in English Bay only), bird eggs, berries and wild vegetables.

Subsistence use (take) of both primary and secondary resources could be affected by human population increases and environmental disturbances in the proposed lease sale area. It could also be affected by potential oilspills. Section IV.A.2.h.(1) discusses direct impacts associated with increased population in the proposed lease sale area. Sections IV.A.2.a. through g. discuss impacts on specific biological resources in the proposed lease sale area. For a general discussion of the Oilspill Risk Analysis, see section IV.A.1.d.

For the proposal, the Oilspill Risk Analysis indicates four major oilspills are likely over the life of the field and a 98-percent probability of at least one spill. A major spill event which contacted shore within 10 days could significantly reduce subsistence take of marine birds, seals, and sea lion, crab, clams, sea urchins, and other shellfish for varying periods of time. If the spill were to occur in winter, beach foraging deer, ducks, and clams might all suffer increased mortality, thereby reducing subsistence take of these species. Fish in their developmental stages could be reduced by a major spill, perhaps significantly reducing the following year's fish catch for that area.

Villages dependent upon seals and sea lions, in particular, might be affected both directly and indirectly by the oiling of sea mammals, as well as by

reduced fish populations. See sections IV.A.2.a. through g. for further discussion of biological impacts.

For this alternative, land segment 15 at Kupreonof Strait has a high risk of oilspill contact (see sec. IV.A.1.d.). Land segments 13 and 17 at Ugak Bay and Black Cape have medium risk of oilspill contact within 10 days. Land segment 15 contains prime nearshore crabbing and fishing grounds of three Kodiak west-side villages (Larsen Bay, Ouzinkie, and Port Lions). Land segment 13 contains prime fishing, clamming, crabbing, and hunting grounds for the villages of Karluk and Larsen Bay. An oilspill at any of these locations or one which spread to the subsistence use areas of the these four villages could significantly effect the local economies of these villages by affecting both subsistence take of residents and money income of commercial fishermen in these villages. All of these villages obtain well over 50 percent of their diet from local subsistence resources. A survey conducted by KANA in Port Lions in February 1979, for example, estimated that 72 percent of local meals include subsistence resources (KANA, 1979, OEDP Report). Without denying the cultural significance of subsistence resources, only one village along Shelikof Strait (Ouzinkie) has a store of sufficient size to provide minimum protein needs in the event of a major disaster which affected subsistence take. All other villages depend on small aircraft or local fishing boats to obtain food from Kodiak grocers. Particularly in winter, residents of Karluk, without a local store, and Larsen Bay and Port Lions, with small, expensive stores, could suffer considerable stress from both the inability to obtain subsistence foods during oilspill cleanup operations and diversion of or weathering in of small aircraft to supply food needs. The reader should consult section III.C.1.d. and Davis (1980) for a more complete discussion of the cultural significance of subsistence foods and practices.

The effects on subsistence take of different species would vary by season and magnitude of the spill, its duration in intertidal areas, current and bottom sediment conditions of the area, as well as species response to oil contamination and other disturbances associated with the spill itself and with cleanup operations.

A range of probable effects can be presented, however. In winter, reduction of subsistence take of ducks and deer might seriously stress village residents whose food stocks were low. If subsistence hunting were restricted during oilspill cleanup or if populations of these resources were depleted by oilspill contact, village residents could be disrupted. In summer, a spill which seriously reduced or tainted salmon stocks and juvenile salmon, crab, and other fish for an extended period of time (months) could severely stress these village economies from 1 to 2 years. If major clam beaches were oiled, villagers might be unable to harvest clams and other "beach food" for several years. Village residents forced to hunt and fish at greater distance from their local areas because of oilspill contamination and its effects could be hard-pressed financially to afford increased transportation costs.

Another way of viewing oilspill risks associated with this alternative is to compare the overall risk of a major oilspill event contacting a village's subsistence use area. Refer to table IV.A.2.h.(4)-1.

According to this table, the average risk is highest for the village of Larsen Bay and lowest for the village of English Bay. These risks shift in the

Table IV.A.2.h.(4)-1
Composite Risk of an Oilspill Event by Village
Shelikof Strait and Cook Inlet Villages

Karluk	24 percent
Larsen Bay	51 percent
Ouzinkie	45 percent
Port Lions	41 percent
English Bay	8 percent
Port Graham	10 percent

Table IV.A.2.h.(4)-2
Composite Oilspill Risk Analysis
Percentage Risk for the Proposal and Cumulative Tankering Risk for
Shelikof Strait Villages, English Bay and Port Graham

	Proposal	Cumulative + Tankering	d =
Karluk	24 %	42 %	18 %
Larsen Bay	51 %	69 %	18 %
Ouzinkie	45 %	64 %	19 %
Port Lions	41 %	60 %	19 %
English Bay	8 %	46 %	38 %
Port Graham	10 %	55 %	45 %

cumulative case. They also do not take into account the effects of chronic small-scale oilspills from oil rigs or tankers, which would be more probable and would likely affect the Port Lions and Anchor Point-Homer areas.

Conclusion: With this alternative, subsistence take of both primary and secondary subsistence resources could be significantly disrupted. This disruption could result from direct and indirect consequences of an oilspill as well as from human population pressure on subsistence resources caused by establishment of OCS facilities in a local area. The disruptions to the local economies of subsistence villages would vary with the season, the size of the spill, and many other factors. A minimum of a few weeks of restricted hunting, fishing, and gathering; greater effort in obtaining sufficient food supplies; and stress associated with food shortages could be expected. If oilspill contamination of major fishing, crabbing, and clamming areas were extensive, village subsistence take could be reduced for several years.

Cumulative Effects: The combined effect of the proposal with present offshore development from sale CI tracts and proposed and existing tankering of oil from Cook Inlet oil discoveries substantially increases the risk of oilspills to English Bay and Port Graham and adds an additional risk of close to 20 percent for each of the Shelikof Strait villages. Table IV.A.2.h.(4)-2 shows both the risk for the proposal and the comparable percentage once cumulative effects of sale CI and proposed and existing tankering are taken into account. Refer to the above discussion for the implications of these increased risks.

These oilspill model predictions show that the added risk to village subsistence use areas is substantially greater for the Cook Inlet villages of English Bay and Port Graham under the cumulative case, because of increased risk due primarily to potential tankering accidents. Additional risk to Shelikof Strait villages is about 18-19 percent for each of the villages. Combined with the already high risk these village subsistence use areas facewith the proposal, the potential risk for the cumulative case is well over 50 percent for all of these villages. It approaches 70 percent for Larsen Bay, largely because its subsistence use area encompasses high risk land segments 13, 14, and 15.

Unavoidable Adverse Effects: The proposed action would increase the risk of oilspill disruption of subsistence village economies. This risk would vary according to a number of factors, but would be greatest for the village of Larsen Bay and would also be high for Port Lions and Ouzinkie. If development occurs, increased population pressure on subsistence resources would also be unavoidable, although the extent of this pressure can be regulated by the Alaska Department of Fish and Game.

i. Impacts on State, Regional, and Local Economies:

(1) State and Regional Impact: The economic impact of the proposal scenario on the state and regional economy is mild and, therefore, not discussed in this text. Those interested in exploring these impacts should see: USDI/BLM/Alaska OCS Socioeconomic Studies Program documents, Technical Memorandums 1 and 2, Lower Cook Inlet EIS, ISER, "The Growth of the Alaskan Economy: Future Conditions Without the Proposal and Lower Cook Inlet Petroleum Development Scenarios: Economic and Deomgraphic Impacts and Supplementary Memorandum.

(2) Impact on Local Economies (Kenai, Homer, Kodiak, and Port Lions Areas): The economic impact of the proposed lease sale on local areas has been identified as a major scoping issue. The local areas likely to be significantly affected by the sale are the Kenai, Homer, Kodiak, and Port Lions areas. Tables IV.A.2.i.-1, -2, and -3 below show the estimated base case employment for the four areas. They also show estimated primary and secondary employment impact of the proposed lease sale assuming a mean development and resource case. These impacts have been calculated by the ISER map and Census Division economic models assuming the proposal and a mean development case. Moreover, this material is summarized in table IV.A.2.i.-4 where impacts and base case employment forecasts are compared for the four areas. Impacts are described below.

Kenai Area: The stimulative employment impact of the proposal on the Kenai area would be mild. As table IV.A.2.i.-4 shows, employment in the Kenai or central Cook Inlet area is forecasted in the base case to increase at a moderate 2.5 percent per year during the 1980's. The table also shows a similarly moderate 3 percent per year growth with the proposed development. An additional hiring of 397 people in 1990 would not disrupt local labor markets because they can easily draw on the large Anchorage labor pool. Besides employment, local hire, and local purchase, a small increase in local tax revenue and expenditures could be expected in the central area because most new facilities and new tax base would be located elsewhere, and borough tax revenues could be channeled toward services in areas where facilities were located.

Homer Area: As table IV.A.2.i.-3 shows, prospective increases in Homer area employment without a sale 60 development are a rapid 5.2 percent per annum during the 1980's. Moreover, the increase in Homer area employment by the end of the 1980's amounts to nearly 400 people which accelerates the growth rate of employment in Homer to a rather high 6.5 percent per year. It seems that this increase in employment implies rapid growth, but not boom conditions in Homer during the 1980's. This would constitute a moderate economic impact. Disruptive impacts from local hire would likely be mild because of the availability of the large Anchorage labor pool. In addition, impacts from local industry purchases would likely be mild as most purchases would likely center in the Kenai area where most existing subcontractors are located. Finally, the increase in tax revenues and government spending impacts for Homer may be moderated because, under the proposal, a large oil terminal would be located in the area, and the State or borough tax revenues could be used to offset the impact of the facility. At a 30 mil rate State and borough revenues would amount to $9 million per year in 1979 dollars. This large sum compares to a less than $1.3 million surplus forecast to be available for capital improvements in the city of Homer in the 1990's (Alaska Consultants, 1980).

Kodiak Area: As table IV.A.2.i.-4 shows, the Kodiak area employment and economy are expected to increase at a moderate 3.7 percent per year during the 1980's. When the employment impact of proposal is added, employment rises by only 200-300, and the employment growth remains a moderate 3.9 percent per year. Thus, the employment impact of the proposal on Kodiak would likely be mild. The employment is small relative to total Kodiak employment, and local hiring should not be disruptive as the development can draw from the Anchorage and stateside labor pool. Industry purchases in Kodiak from subcontractors would also be relatively small because of the lack of oil industry subcontracting services in Kodiak. Only some mild increases in trade and transport type

Table IV.A.2.i.-1
Base Case Employments
Lower Cook and Kenai

Year	Kenai Soldotna Area Total Employment	Non-Camp Employment	Construction Camp Employment	Homer Area Total Employment	Non-Camp Employment	Camp Employment	Kodiak Areas
1980	5,386	5,240	146	1,742	1,742	---	6,349
1981	5,269	5,425	844	1,814	1,814	---	6,694
1982	6,916	5,593	1,323	1,897	1,897	---	7,028
1983	6,048	5,628	420	1,976	1,976	---	7,377
1984	5,829	5,829	---	2,068	2,068	---	9,765
1985	6,100	6,017	83	2,295	2,211	84	8,100
1986	6,431	6,309	122	2,526	2,442	84	8,373
1987	6,560	6,507	53	2,602	2,602	---	8,609
1988	6,751	6,751	---	2,799	2,799	---	8,840
1989	6,750	6,750	---	2,763	2,763	---	8,982
1990	6,906	6,906	---	2,892	2,892	---	9,163
1995	7,692	7,672	---	3,313	3,313	---	10,094
2000	8,336	8,336	---	3,619	3,619	---	10,628

Source: Alaska Consultants Lower Cook Inlet Petroleum Development Scenario, Local Socioeconomic Systems Impact Analysis BLM/Alaska OCS Socioeconomic Study Program, pp. 77-78.

Table IV.A.2.i.-2
Kodiak Census Division
Mean Find Scenario Impacts

Year	Direct Employment	Secondary Employment	Total Employment	Total[1/] Kodiak City (resident)	Total[1/] Port Lions (resident)
1980	---	---	---	---	---
1981	---	---	---	---	---
1982	155	22	177	177	---
1983	39	19	58	58	---
1984	39	31	70	70	---
1985	38	24	62	62	---
1986	276	132	408	318	90
1987	254	118	372	282	90
1988	194	96	290	200	90
1989	194	90	284	194	90
1990	198	118	316	226	90
1995	198	122	320	230	90
2000	198	131	329	239	90

[1/] Port Lions employment equals by assumption one-half of operating personnel for the terminal (60) plus 50 percent for secondary employment (30). The remaining employees are assumed resident in near by Kodiak City even though some of them (as during construction) may barrack in Port Lions.

Source: Porter, E. D., 1980, p. 65

Table IV.A.2.i.-3
Kenai/Cook Inlet
Mean Find Scenario Affects

Year	Direct Employment	Secondary Employment	Total Employment	Kenai Soldotna Area 1/	Homer Area 1/
1980	---	---	---	---	---
1981	---	---	---	---	---
1982	85	32	117	59	59
1983	87	31	116	58	58
1984	97	22	119	60	60
1985	121	33	154	77	77
1986	508	122	630	315	315
1987	657	169	826	413	413
1988	585	168	753	376	376
1989	585	174	759	379	379
1990	610	183	793	397	397
1995	544	188	732	366	366
2000	544	203	747	374	374

1/ The census division employment impact is split 50/50 between the southern and central areas.

Source: Porter, E. D., 1980, p. 64

Table IV.A.2.i.-4
Employment Impact
Mean Find Scenario

Year	Kenai Area Base Case Employment	Kenai Area Base Employment Impact	Homer Area Base Case Employment	Homer Area Base Employment Impact	Kodiak[1/] Area Base Case Employment	Kodiak Area Base Employment Impact	Port Lions[2/] Area Base Case Employment	Port Lions Area Base Employment Impact
1980	5,386	---	1,742	---	6,349	---	166	---
1981	6,269	---	1,814	---	6,694	---	171	---
1982	6,916	59	1,897	59	7,028	117	176	---
1983	6,048	58	1,976	58	7,377	58	181	---
1984	5,829	60	2,068	60	7,765	70	186	---
1985	6,160	77	2,295	77	8,100	62	192	---
1986	6,431	315	2,526	315	8,573	318	198	90
1987	6,560	413	2,602	413	8,609	282	204	90
1988	6,756	376	2,799	376	8,840	200	210	90
1989	6,750	379	2,763	379	8,982	194	217	90
1990	6,906	397	2,892	397	9,163	226	223	90
1995	7,692	366	3,313	366	10,094	230	258	90
2000	8,336	376	3,619	374	10,628	239	299	90
Annual Change 1980-1990 TOTAL	2.5%	3.0%	5.2%	6.5%	3.7%	3.9%	3.0%	6.6%

1/ Includes Port Lions

2/ Port Lions base case employment is assumed to increase at a moderate 3-percent rate over the period. The 1980 employment is from Kodiak Census Division Health Plan material cited in sections III.H.3. and III.C.2.b.

Source: Alaska Consultants Lower Cook Inlet Petroleum Development Scenarios, Local Socioeconomic Systems Impact Analysis BLM Alaska OCS Socioeconomic Study Program, pp. 77-

services would likely occur. Similarly, a government spending boom due to increased tax revenues would be unlikely if Port Lions annexed the oil terminal hypothesized for the area. However, this may not be the situation and a $300 million dollar terminal would then generate a large revenue ($9 million) for the borough. In this case, considerable borough government spending might occur through various transfer arrangements.

Port Lions Area: As table IV.A.2.i.-4 shows, the Port Lions area is forecast to have moderate growth of 3 percent over the proposal's development period. With development of an oil terminal in the Port Lions area, the employment in 1990-95 would increase from 223 to 258. Over the decade, annual growth more than doubles to a high 6.6 percent. The number of construction workers living in the Port Lions area barracks have been, for impact purposes, assigned to Kodiak employment as have one-half the terminal operating personnel. These employees may impact the Port Lions area more than assumed.

In summary, the proposal could cause major economic and employment impacts in Port Lions. These impacts are mainly in the form of permanent employment and could be considered to be favorable. The development is so large relative to the town that potentially disruptive local hiring may occur if not dealt with through industry and community planning. Potential for disruptive impacts from local purchases would be large and limited only by the complete lack of needed facilities and subcontractors in Port Lions. Finally, the potential for government spending by the municipality of Port Lions would probably be good if the town annexed the terminal area.

Kodiak Island Villages: It appears likely that direct employment and income impacts would be virtually non-existent (not greater than the projected 2 percent per annum rate) for Karluk, Larsen Bay, Akhiok, Ouzinkie, and Old Harbor. It is likely there will be little new employment created in these five villages. Some small indirect employment opportunities would perhaps be created in all villages due to some increase in recreation and tourism travel in Southcentral Alaska. These increases, however, would depend on whether new opportunities and services are provided by local residents. Local residents may or may not choose to encourage or discourage this type of economic activity.

Conclusion: Mild employment and economic impacts would be likely in the Kenai and the Kodiak areas because of their large sizes. Moderate impacts would likely occur in the Homer area because of its location near the hypothesized oil terminal and its smaller size. Finally, major impacts would likely occur in the Port Lions area due to the town's relatively small size and the hypothesized oil terminal located there.

Cumulative Effects: If sale CI moves into a development stage, and sale 60 exploratory activities are successful, economic boom conditions could occur in Kodiak.

Unavoidable Adverse Effects: It seems likely that no unavoidable adverse economic impacts will occur because of the proposal. The reason for this is that the moderate impact on the Homer area and the major impact on the Port Lions areas are largely due to permanent employment increases which many would consider economic benefits rather than losses.

j. Impacts on Cultural Resources: Impacts from offshore activities could indirectly and directly affect archeologic and/or historic resources. Direct sources include oilspills (appendix E) and construction activities (secs. IV.A.1.b. and c.). Indirect sources include induced industrialization (secs. IV.A.1.b. and c.), changes in population (secs. III.C.1.a. and IV.A.2.h.(1)) and changes in land use status (sec. III.C.5.a).

The lower Cook Inlet and Shelikof Strait shorelines have numerous prehistoric and historic cultural resources listed by the Alaska Department of Natural Resources, Division of Parks (Heritage Resources Survey, 1980) (sec. III.C.3.). Many areas formerly above water and now beneath the inlet and strait show evidence of man. Small bays with shallow access may contain undisturbed archeological sites.

Procedures are being established by the Advisory Council on Historic Resources, the State Historic Preservation Officer (keeper of the Alaska Heritage Resource Survey File), the National Park Service, the Geological Survey, and the Bureau of Land Management to ensure protection of submerged cultural resources.

If the proposal is implemented, some cultural resources may be subjected to change. The probability of these impacts occurring ranges from very likely to very unlikely. However, impacts on cultural resources in the lower Cook Inlet are expected to be minimal.

Direct effects are those such as construction activity, which would directly damage or destroy a cultural resource. Other direct effects would result from activities, such as pipeline construction or an oilspill. Archeological sites could be damaged by oil and could be further damaged by oil removal.

The sites most suited for pipeline landings and construction are also those with the highest probability of containing cultural resources. Offshore construction activities, such as platform installation and pipeline burial, could damage or destroy archeological sites. Pre-construction surveys would probably result in the discovery of most cultural sites in the area. These surveys may be conducted after consultation with the Geological Survey District Conservation Manager, the Council on Historic Resources, and the State Historic Preservation Office.

Onshore, an increase in population could result in a rise in "pot-hunting" at accessible historic and prehistoric sites. With increased population, the risk and incidence of wild fires could rise, and sites, such as Tanaina house remains or pioneer cabins, may be damaged or destroyed. Fire control activities, such as trail building, could also damage cultural resources. The Heritage Conservation and Recreation Service (HCRS) has proposed a program for occupancy and maintenance of historic cabins and houses, which may alleviate some impact.

National Register Sites: The Bureau of Land Management (BLM) and the State Historic Preservation Office (SHPO) have agreed that the sites shown on graphic 13 are on, or have been nominated to the National Register of Historic Places. Although the list is complete for National Register sites, the State Historic Preservation Office points out, and the Bureau of Land Management concurs, that many additional known and undiscovered sites exist within the area. The BLM and SHPO staffs further agree that the following five sites are the National Register listings that appear most vulnerable if this proposal is implemented.

Selenie Lagoon Archeological Site: This site, AHRS-SEL-064, is comprised of a midden which is considered to hold very significant information. Adverse impacts could occur from oilspills reaching the site, by pothunters in the region, and by potential OCS development at the site.

Yukon Island: This site, SEL-001, is exposed to wave action and could be contaminated by an oilspill. Pothunters also pose a potential problem. Because the island is open to the public, with the exception of a small privately-owned area, it would not be subject to land use changes unless selected under the Alaska Native Claims Act.

Chugachik Island Site: This island, SEL-033, is comprised of many middens and other sites. Some middens are exposed to storm tides and would have a small chance of oilspill contamination. Pothunting is currently a problem and would likely increase unless controls are imposed. Chugachik Island is part of Kachemak Bay State Park.

Cottonwood Creek Site: The large midden at this site, SEL-030, is exposed to storm tides, and may be exposed to oilspill contamination or to pothunting. The site is on public land.

Coal Village Site: This site, SEL-021, is a former Russian coal mining operation. Remains include some narrow gauge railroad tracks, building foundations and mine pits. The lower part of the site could be affected by an oilspill, but the effect would be visual and temporary.

The SHPO and BLM staffs have concurred that two National Register listings, Ninilchik and Hope, could be indirectly and potentially adversely affected.

Ninilchik: Ninilchik, KEN-032, still retains a 19th century Alaskan village atmosphere. Industry-related population increases or industrial construction could result in an influx of new residents and changes in land use. New population and construction could radically alter the character of the village.

Hope: Hope, SEW-018, is much the same now as it was 70-80 years ago. Some minor increase in permanent residents and commerce would be beneficial in maintaining the town's viability, but excessive growth could damage its historic character. If development on the Kenai Peninsula occurs, the town's cultural resources may be stressed because of increased visitors to the site.

The BLM and SHPO staffs have concurred that development resulting from the proposal may potentially impact archeologic or historic sites and structures around Kenai and Seward. Many known sites and buildings exist in both areas that are considered possibly significant for inclusion on the National Register.

Other cultural resources not along the shore that have high potential risk (see sec. IV.A.1.d. for a discussion of oilspill risk), are the Kamishak Bay area, Anchor Point, Ushaget Island, the Barren Islands, the Karluk area, and the areas across the Shelikof Strait from Karluk on the Alaska Peninsula.

Marine Archeology: Federal agencies are required by Executive Order 11593 to locate, identify, and nominate to the National Register of Historic Places qualifying cultural resources within their jurisdiction. Presently, BLM/OCS studies are being conducted by the University of Alaska, and procedures have

been established involving the HCRS, in its role as technical advisor for such resources, the Geological Survey, and the Bureau of Land Management, whereby a satisfactory cultural resource reconnaissance survey may be implemented to discover these resources prior to construction. The actual mechanics and required procedures for conducting this survey are found in the "Notice to Lessees and Operators" (appendix D). This procedure sets forth the precise specification and equipment requirements which shall be used. (See cultural resources stipulation in sec. II.B.1.b.)

The BLM, upon identification of areas of high probability for submerged cultural resources, would make specific recommendations to the Geological Survey District Conservation Manager with which leased tracts stipulation should be enforced. BLM would also recommend a specific set of criteria for conducting these surveys and would submit these recommended operating procedures to the District Conservation Manager. After receipt of these recommendations, the Geological Survey would then decide whether to follow the recommendations of the BLM or to take another course of action. Only the Geological Survey, not the BLM, has the authority to enforce cultural resource stipulations, and this primarily depends on the decision of the District Conservation Manager. Although the District Conservation Manager is obligated to consider the recommendations of the BLM (refer to Secretarial Order 2974, appendix D), he is not required to follow these recommended courses of action.

Based on an evaluation of the geological characteristics of the proposed lease area, there is little potential for the occurrence of submerged cultural resources. There are, however, a number of proposed lease blocks (see the red blocks on graphic 13) in the lower Cook Inlet and Shelikof Strait which have some potential for containing prehistoric or historic cultural resources. It has been suggested that these areas be surveyed (Alaska OCS Office Staff, 1980).

If cultural resource surveys are not performed adquately, or if cultural resources exist and are not detected, then they could be damaged by pipeline construction or by anchors dragging from drillships.

Conclusion: The onshore cultural resources in the area of the proposed sale may be directly, adversely affected if a major oilspill reaches the shoreline. Oilspill risk for shore sites is generally moderate. Onshore sites could be adversely affected by construction activities, industrialization, increased population in the area, and changes in land use status.

Cumulative Effects: Cultural resources in the lower Cook Inlet could be additionally impacted by several other proposed actions (refer to sec. IV.A.1.h.). Impacts on historic and prehistoric archeologic sites would be in danger of oilspill contamination, damage by construction, and damage resulting from increased population and land status changes. The cumulative effect would be an increased probability that cultural resources in the lower Cook Inlet and Shelikof Strait would be adversely affected.

Unavoidable Adverse Effects: Although surveying and core sample examination should reduce unavoidable adverse effects, some artifacts would probably be lost as a result of OCS activities.

k. Impacts on Visual, Wilderness, and Recreation Resources: The proposed lease sale would result in insignificant impacts on the surrounding area in the form of the few platforms which might be visible from the air, from boats, and from points along the Sterling Highway. An oilspill would cause temporary visual impact, especially along the coast, where the greatest number of people would have opportunity to view it.

Impact to wilderness resources would result from pipeline construction along the 16 kilometer (10 mi) stretch of land from Chernof Point to Talnik Point on Kodiak Island. The wilderness character of the area would be temporarily disrupted.

If OCS development occurs causing increased population, it would be likely that some wilderness areas (Alaska Peninsula, Kodiak Island, Kenai Peninsula, and the western side of Cook Inlet) would be more heavily used for recreation. There would probably be no measurable adverse impact on the wilderness character of these areas, given the low population increase projected for this alternative.

OCS-related population increases would result in an unquantifiable increase in competition for recreation resources, principally clams, halibut, and salmon. These impacts would most likely be felt by those who seek recreation in already heavily used areas of the Kenai Peninsula, such as the Sterling Highway, Clam Gulch, the Russian River, and Homer (see sec. III.C.4.) and by those who use Cook Inlet for recreational fishing. Increased pressure on recreation resources near the City of Kodiak and near Port Lions could be expected.

An oil terminal at Anchor Point would result in displacement of 120 acres (49 hectares) from recreation use.

Petroleum-related vessel traffic in Shelikof Strait near Kodiak and Port Lions, and in Cook Inlet would probably not interfere with recreational boat traffic.

Oilspills would pose a risk to recreation resources such as clams, fish, and beaches. Refer to sections IV.A.2.a. and b. for a more detailed discussion of impacts on these resources.

Conclusion: Adverse impacts on visual, wilderness, and recreation resources would be minor and temporary. Platforms and oilspills would result in visual impacts. Construction activities in wilderness areas would temporarily disrupt the character of these areas. Population increases resulting from OCS activities would result in slightly greater recreational use of wilderness areas and other already heavily used recreation areas, especially on the Kenai Peninsula. Oilspills could adversely affect recreation resources as described in sections IV.A.2.a. and b.

Cumulative Effects: Existing oil and gas activity in Cook Inlet adds risk to visual, wilderness, and recreation resources from oilspills most notably in the Anchor Point and Kamishak Bay areas. Oilspill risk increases there from medium and low, respectively, in the proposal, to high when sale CI and existing tankering activities are also considered (see sec. IV.A.1.d.).

Population increases resulting from the proposal plus other projects (described in sec. IV.A.1.h.) would likely result in increased use of already heavily used recreation areas as well as greater use of wilderness areas and would very likely contribute more to increased recreation pressure than the proposal alone.

Unavoidable Adverse Effects: Unavoidable visual impacts would result from platforms and oilspills. Displacement of wilderness acreage for construction of pipelines and OCS-related facilities would be unavoidable. Increased use of recreation resources in wilderness and already heavily used recreation areas, and oilspill impact on recreation resources such as beaches and fish, would likely occur and could not be avoided.

1. Impacts on Land Status and Land Use:

Impacts on Land Status: Technically, land status impacts refer to ownership and interests in land, and configuration of land parcels, etc., rather than the use of land. For the Cook Inlet portion of the proposed sale area, land status impacts would not be significantly affected during the exploratory phase of operation. OCS use of onshore support bases, public docks, etc., would all involve existing facilities and land suitable for this purpose. The construction of port of Homer improvements and the possibility of acreage being made available for an OCS staging area and supply base is more of a land use rather than a land status impact. Refer to section III.C.5.c. regarding the port of Homer Development Plan.

The proposed scenario presumes onshore facilities in the Cape Starichkof/ Anchor Point area, with a gas pipeline running along the Kenai Peninsula to Kenai. The Cape Starichkof/Anchor Point coastal area is already in predominate private land ownership. Assuming that land purchase or lease agreements can be established between the property owners and OCS operators, the only land status impact in this area would be a division of legal parcels. Further land division activity may occur around the onshore terminal, processing facilities (if any), and gas compressor stations.

The siting of a gas pipeline from the marine terminal-pipeline landfall to the Nikiski liquefaction facility could result in a significant land status impact. The land ownership pattern is mixed among the State of Alaska, the Kenai Peninsula Borough, individual cities, Native village corporations, the Cook Inlet Region, Inc., and private land owners contiguous to the Sterling Highway corridor. Successful siting of the gas pipeline may involve land exchanges, land divisions, and right-of-way easements. This land status impact would be mitigated to the extent that an existing utility transmission line corridor, which parallels the Sterling Highway, could be used for siting of a buried gas transmission line.

For the Shelikof Strait portion of the proposed sale area, the siting of a marine oil terminal at Talnik Point and an oil pipeline from Cape Chernof to the oil terminal could cause significant impacts on land status. The possibility of a significant adverse impact turns on the willingness of the land owners, the Afognak Native Corporation and/or the city of Port Lions, to either sell, lease, or otherwise grant a right-of-way easement to their land. Neither land owner has made an official statement regarding the availability of its land for an OCS onshore support facility, marine terminal, and/or an

oil pipeline. Refer to section III.C.5.c. regarding the Port of Lions Comprehensive Development Plan.

Impacts on Approved Land Use/Master Plans: The land use impacts ensuing from the proposal can be defined in two different respects: a) the estimated acreage requirements of the postulated onshore OCS-related facilities; and b) the conflict or inconsistency of the postulated onshore facilities with approved land use/master plan(s). This latter definition of land use impact derives from CEQ regulations implementing NEPA (40 CFR 1502.16(c), 1506.2(d); 43 FR 55978).

The following impact assessment compares a schematic location of postulated onshore facilities against applicable plan requirements. No specific site review is performed in this EIS because no site specific development actions are included in the OCS leasing proposal.

The environmental assessment on the proposal includes a petroleum development scenario. The purpose of this scenario is to hypothesize plausible events ensuing from the sale based upon industry experience and behavior. The scenario specifically includes assumptions on onshore facility requirements. However, only a schematic location of the postulated facilities is provided in a candidate area given the uncertainity on eventual exploration and production plan submittals. Refer to section II.B.1.a. for further discussion of the purpose and contents of the petroleum development scenario.

Impacts of Postulated Oil Terminal and Gas Compressor Station at Cape Starichkof-Anchor Point: The acreage requirements for the oil terminal and related facilities is estimated at 120 acres (49 hectares), while the requirement for the gas compressor station facilities is 40 acres (16 hectares). Refer to table II.B.1.a.-1 regarding the petroleum development scenario. The aggregate acreage requirement for both of these facilities, 160 acres (64 hectares), would be accommodated by vacant lands specifically reserved for industrial use in the Cape Starichkof area. The Draft Final Ports and Harbors Plan of the Kenai Peninsula Borough (KPB) recommends setting aside roughly 900 plus acres of land in the Cape Starichkof area (Woodward-Clyde Consultants, 1980). Thus, the postulated OCS onshore facilities will moderately impact the inventory of land recommended to be zoned for industrial use.

On the basis of plan policies alone, the siting of energy production facilities, i.e., oil terminal and gas compressor station, outside of the North Kenai-Nikiski area would be incompatible with the approved KPB Plan. However, the approved plan also states that if new energy development facility needs emerge from OCS operations in Cook Inlet, then the borough and community plans should be revised. Refer to section III.C.5.c. regarding the KPB "Comprehensive Planning Program: Recommendations" (Alaska State Housing Authority, 1970). The proposed oil terminal and gas compressor station would nominally pose an adverse land use impact on the KPB 1970 Plan. However, this impact will apparently be mitigated or eliminated by future KPB Plan changes.

The Borough is in the process of finalizing a Ports and Harbors Master Plan which, however, has yet to be officially adopted (Woodward-Clyde Consultants, 1980). The Draft Final Plan calls for a deep water port at Cape Starichkof to accommodate the OCS energy transportation needs, among other uses. In context of this Draft Final Plan, the scenario assumption of a marine oil terminal at

Cape Starichkof would appear to be compatible with it and pose no adverse land use impacts.

If the gas pipeline landfall and onshore gas compressor station were sited within the Borough's plan area for Anchor Point, then this location would be inconsistent with the land use policies for Anchor Point. However, these facilities could be located north of the Anchor Point Plan area. Also, the KPB Plan for the unincorporated area could be revised as indicated above.

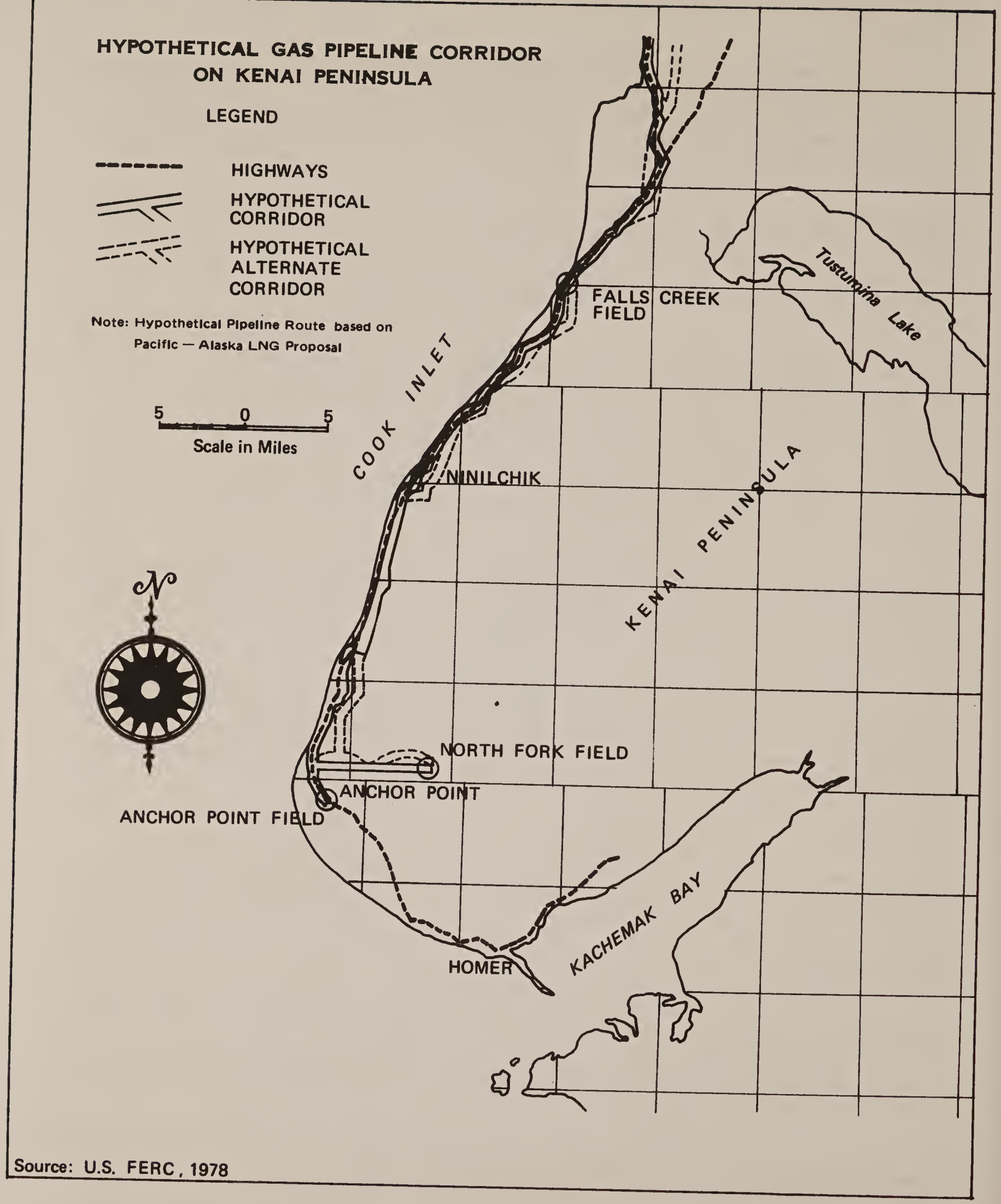
Impacts of the Postulated Gas Pipeline from Cape Starichkof/Anchor Point to Nikiski: The scenario includes a gas pipeline which is schematically located in a corridor paralleling the Sterling Highway from the pipeline's southern terminus north to the city of Kenai. From Kenai, the pipeline corridor would parallel the Kenai Spur Road to the existing liquefaction facilities in the north Kenai/Nikiski area. Figures IV.A.2.1.-1 and -2 offer a possible corridor delineation for the gas pipeline. The figures are derived from a proposal of the Pacific-Alaska LNG Associates (U.S. FERC, 1978) to construct a collection system of gas pipelines to serve its proposed liquefaction plant and marine terminal at Nikiski. It should be emphasized that the pipeline corridors shown on figures IV.A.2.1.-1 and -2 are schematic only and do not fix a specific route. Acreage estimates for the gas pipeline include the following: The right-of-way (ROW) requirement could be in the range of 30 feet (low) to 100 feet (high). Given a pipeline distance of 7 miles (113 kilometers), estimated in the development scenario, the pipeline acreage requirements would range from 254.5 acres (103 hectares) to 848.5 acres (343.4 hectares). These acreage estimates can be readily accomodated by vacant lands contiguous to the Sterling Highway corridor on the Kenai Peninsula and along the Kenai Spur Road. Hence, no significant impact upon vacant land inventory on the Kenai Peninsula is expected from the postulated pipeline.

The Pacific-Alaska LNG facility and gas pipeline application assumed a 50-foot ROW requirement for the pipeline. The application also indicated that additional land clearance would be required along the ROW for construction and maintenance purposes. However, no estimate of additional ROW beyond 50 feet was offered in the FEIS on the proposal (U.S. FERC, 1978).

The impacts of the postulated gas line upon the land use policies and plan of the KPB are unclear: The Borough's policies on petro-chemical facilities being sited in Nikiski refer to heavy industrial facilities for processing of hydrocarbons and manufacturing of hydrocarbon products. The policies do not address transmission lines which pose a negligible permanent impact in terms of labor force, infrastructure, emissions, etc., especially when the transmission lines are buried. Finally, the Borough's 1970 plan offers no land use policy on the siting and compatibility of pipelines which pre-existed the plan. Given the ambiguity of the Borough's plan on pipeline siting, it is difficult to identify the adverse affects of the postulated pipeline corridor upon the KPB plan. Moreover, the Borough's intention to modify its plan, pending new commercial finds of hydrocarbons, could mitigate or eliminate any possible adverse land use impacts from siting of the postulated gas pipeline.

The routing of a gas pipeline through the Kenai Flats area under the jurisdiction of either the city of Kenai's Comprehensive Plan (R.W. Thorpe and Associates, 1979) or the Corps of Engineers (COE, 1978), could adversely impact restrictive land use designations in the area. Both the Kenai and COE plans

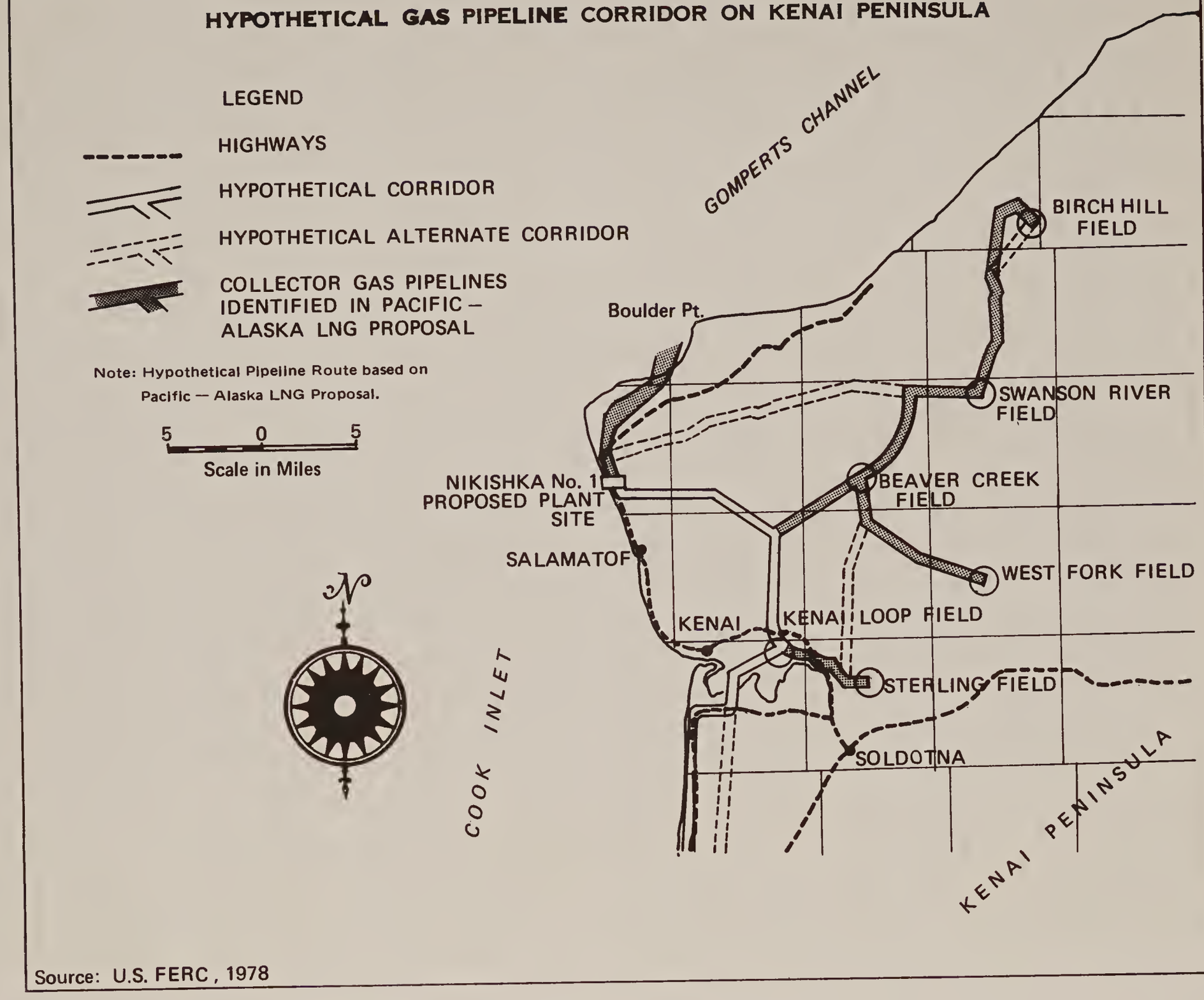
FIGURE IV. A. 2. I.– 1



Source: U.S. FERC, 1978

FIGURE IV. A. 2. I.– 2

HYPOTHETICAL GAS PIPELINE CORRIDOR ON KENAI PENINSULA



Source: U.S. FERC , 1978

would protect critical wetlands habitat. Additionally, the Kenai Plan identifies lowland areas which, for various reasons, pose constraints on development. Refer to section III.C.5.c. regarding these plans.

The land use policies of the Kenai Plan regarding publically owned wetlands in its "Conservancy Zone" are unclear with regard to the siting of the gas transmission line: If the gas pipeline can be construed in the land use category of "Transportation" or "Utilities" and is found to be coastally dependent in its siting, then it would be allowed in the wetland areas. However, if the pipeline is found to be not coastally dependent in its siting, or the city commits its publically owned wetlands to preservation through a rezoning act, then the gas pipeline would be a disallowed use of the municipality-owned wetlands. This latter situation poses a clear conflict in land uses and the postulated pipeline corridor would constitute a significant adverse impact. This impact could, however, be eliminated by routing the pipeline to the east of the publically owned Kenai River Flats-wetlands area.

With regard to the COE Kenai River Review, a gas pipeline sited across the wetlands area and the navigable portion of the Kenai River would require COE permits. Under the COE's "Permit Activities Classification" for the area, the proposed pipeline could be a compatible land and water use. This finding of land use compatibility turns on specific construction and pipeline design practices. These practices cannot be identified with this EIS on an OCS leasing proposal only. Presumption of a pipeline applicant's willingness to comply with COE permit conditions, which would reflect in part U.S. FWS concerns, would result in no adverse land or water use impacts upon the COE Plan. Refer to section III.D.3.b. and III.A.2. regarding a U.S. FWS proposal for "Area Meriting Special Attention" designation of the Kenai River Flats area under the ACMP.

As the postulated gas pipeline corridor moves northward to the Kenai city limits and enters the unincorporated area of north Kenai/Nikiski, it would be regulated by a Borough Comprehensive Plan for the unincorporated area. The Borough's plan for the north Kenai/Nikiski area specifically allows and encourages industrial and energy facilities to be sited in the coastal zone. Hence, the postulated gas transmission line is presumed to be a compatible land use with this KPB Plan area. Refer to figure III.C.5.b.-1 for a schematic diagram of the Borough Plan.

Impacts on Liquefaction Facilities at Nikiski: No land use impacts of the liquefaction facilities or the marine terminals at Nikiski are expected because a) there are existing facilities of this type, and b) proposed facilities have been approved by Federal, State, and local regulatory agencies (U.S. FERC, 1978), and c) the KPB Plan for the north Kenai/Nikiski area specifically allows heavy industrial and petrochemical industry land uses.

Impacts of Postulated OCS Support and Supply Base Operations at Nikiski and Homer: The petroleum development scenario assumes that all marine support and supply operations will be handled through either Nikiski or Homer. The existing support and supply bases at Nikiski, including storage yards, helicopters pads, marshalling areas, should suffice for both exploration and production phases of sale 60. The existing Rig Tenders Dock at Nikiski should also suffice for goods movement and forwarding operations to berth rig tendors and supply boats. Hence, no land use impacts for support and supply base activity at Nikiski are anticipated.

The support and supply operations at Homer would impact existing facilities if no improvements in existing facilities were made. The existing city dock of Homer can handle OCS support and supply functions. However, the berthing capacity is limited, interference with other maritime commerce can occur, and insufficient storage yards and marshalling areas could pose problems for goods movement.

Land use policies of the city of Homer appear to tentatively accomodate OCS onshore support and supply functions (City of Homer, 1978). The city's "Comprehensive Development Plan" does not specifically disallow these land uses and considers their presence in this city's future. However, the plan also indicates that adverse effects from OCS spillover land use impacts would be dealt with effectively.

Better guidance on the city's land use policy towards OCS support and supply base activity is available in its Draft Port of Homer Development Plan (TAMS Engineers, 1980). Based upon this draft plan, the proposed improvements to the port of Homer would clearly accomodate and would anticipate OCS support and supply operations. If the plan is adopted by the city and the KPB, no adverse land use impacts from expanded OCS support and supply operations at the Port of Homer are anticipated.

Impacts of Postulated Oil Pipeline and Marine Terminal Development in the Kizhuyak Bay Area: The petroleum development scenario includes an oil pipeline on portions of Kodiak Island. If a commercial find of oil is made in the Shelikof Strait portion of the sale area, the postulated pipeline would be routed in the unincorporated territory of the Kodiak Island Borough (KIB). The land use impacts of this postulated pipeline on KIB land use policy are difficult to determine: The adopted KIB Comprehensive Plan assesses the Chiniak Bay area only (Tryck, Nyman, and Hayes, 1972). Hence, there is no land use/master plan established for the area of the postulated pipeline corridor. More recent plans and studies sponsored by the Borough have not been officially adopted but are expected to be incorporated into the Borough's Coastal Management Program (CMP). Refer to sections III.D. and IV.A.2.n. regarding the Borough's CMP and the impacts of the proposal on this program. The Borough has an adopted "OCS Development Goal" which discourages the development of OCS-related facilities in or around population centers on Kodiak Island. Additionally, the goal requires such facilities to be self-sustained and to be remotely sited. Expressing this goal as a land use policy, the postulated pipeline routing could be considered compatible in that it would not be near a population center. The southern terminus of the pipeline at Talnik Point would be at least 3 miles from the community of Port Lions. The postulated pipeline corridor could also be considered remote: It would be sited in de facto wilderness. Finally, the pipeline would be self-sustained through operator maintenance of pumping stations and service facility sited with the postulated marine terminal (see below).

The petroleum development scenario assumes a ten-mile (16 kilometer) pipeline distance from Cape Chernof to Talnik Point. The acreage requirements estimated for the oil pipeline would be 36.4 acres (14.7 hectares) assuming a 30-foot ROW, or 121.2 acres (49.1 hectares) assuming a 100-foot ROW. The range of acreage requirements for siting of the pipeline are expected to pose an negligible impact on vacant lands inventory in the de facto wilderness area.

However, the terminal and related facilities may not be considered sufficiently remote and distant from the population center of Port Lions. The Talnik Point area is beyond the city limits of Port Lions; the postulated terminal would pose no land use impacts upon the Port Lions Comprehensive Development Plan. The acreage requirements for a marine terminal and related facilities at Talnik Point are estimated to be 160 acres (164 hectares). Siting of these facilities should pose an insignificant impact upon vacant land inventory for the area as it is presently de facto wilderness.

Impacts of Spillover Land Uses from OCS Development: Spillover land use impacts from OCS development are defined as indirect development activity which ensues from a commercial find of OCS hydrocarbons and a decision to produce the hydrocarbons. These impacts are difficult to project with any confidence because of the uncertainities involved.

Spillover land use impacts on the central Kenai Peninsula area of Kenai-Soldotna-Nikiski, as well as the Homer area, are detailed in the BLM OCS sponsored Local Socioeconomic System Study for OCS Sale 60 (Alaska Consultants, 1980). Summary findings of this study are the following:

a. For the city of Kenai, the demand for residential land use could be 135 acres, or less than 2 percent of land available for residential land use under the plan (73,110 acres).

b. For the city of Soldotna, the demand for residential land use could be 125-130 acres, or approximately 35 percent of the available land zoned for residential land use (330 acres). However, it should be noted that an additional 2,860 acres of unclassified city lands are undeveloped; some of this acreage could be suitable for residential use and could be available for eventual development.

c. For the city of Homer, the demand for residential land use could be 210 acres. The city of Homer Comprehensive Development Plan provides no projection of planned residential land use in acres. Additionally, the plan provides no inventory of existing residential land uses in acres. In the absence of discrete land use information, there is a possibility of a significant residential land use impact upon the city of Homer.

Spillover land use impacts upon the community of Port Lions from the siting of a marine oil terminal and related facilities, as well as the onshore pipeline terminus, are difficult to estimate. The extent of the spillover effect depends upon whether the terminal-pipeline operator provides on-site housing and support services, whether this arrangement is imposed by land owners and/or the KIB through lease instruments or land use regulations, or whether the community of Port Lions encourages additional residential development. There is ample vacant land within the city limits of Port Lions. An inventory of legal parcels in residentially-zoned areas exists in the community, and there are recorded land patents from which new residential subdivisions could be devised. Given the uncertainity of the spillover land use activity, and the small size of the community of Port Lions, there is a possibility of a significant adverse impact upon local land use from the siting of the postulated OCS facility.

Spillover land use impacts upon local communities can be mitigated to the extent that the communities pursue aggressive planning programs. If the communities do not wish to experience spillover residential growth, then recourse is available through participation in the Alaska Coastal Management Program (ACMP), reviewing and commenting upon the OCS development and production plan submittals, and negotiating with OCS operators to provide enclave housing facilities.

Conclusion: The summary findings of land use impact assessment are:

No significant impact of facilities postulated in the scenario in terms of acreage requirements are anticipated because of the size of vacant lands inventory.

The marine oil terminal and related facilities along with the gas compressor station postulated for the Cape Starichkof/Anchor Point area will be consistent with the Draft Final Ports and Harbors Plan of the Kenai Peninsula Borough (KPB). The facilities are inconsistent with the 1970 plan for the unincorporated peninsula. However, this plan anticipates revisions if new OCS finds are made.

The gas pipeline postulated from Cape Starichkof to Nikiski would have indeterminate land use impacts upon the KBP 1970 Plan. The gas pipeline could pose significant adverse impacts on the Kenai River Flats area in terms of the city of Kenai Comprehensive Plan and the U.S. COE River Wetlands Review Requirements.

The scenario's postulated usage of existing (Phillips Petroleum) and/or proposed (Pacific-Alaska) gas liquefaction facilities and marine terminals at Nikiski is consistent with existing, as well as proposed, land use for the area.

The support and supply facilities operations posulated for the communities of Nikiski and Homer should not pose any significant adverse impacts if the Draft Final Borough Ports and Harbors Plan and Port of Homer Development Plan are adopted. If no improvements are made to the Homer Spit and the Port of Homer's existing facilities, then significant adverse impacts on land use from support and supply bases could occur.

The postulated oil pipeline from Cape Chernof/Talnik Point and the oil terminal at Talnik Point would have indeterminate land use impacts because of the absence of any Kodiak Island Borough (KIB) plan for the area. The postulated facility locations could be considered consistent with an official KIB "OCS Development Goal". Resolution of land use impacts, if any, from these postulated facilities could occur through the KIB Coastal Management Program.

Spillover land use impacts upon local communities, such as Kenai, Soldotna, Homer, and Port Lions, from OCS development are difficult to determine. Recognizing the uncertainities, there is a possibility of significant adverse effects upon land use plans of Soldotna, Homer, and Port Lions.

Cumulative Effects: Cumulative land use effects of the proposal are discussed for each element of the scenario summarized above:

The only cumulative land use impact upon the Cape Starichkof area would be if a deep water port were established there along with the marine oil terminal. This is a possibility, however, no proposals have been forwarded, and it more likely that such a port would be located near or at existing ports in the Kenai Peninsula.

The siting of the postulated gas pipeline may be cumulatively impacted by other utility lines or an additional oil or gas pipeline sited in the same right-of-way (ROW) corridor. It is expected after the first pipeline ROW has been established, that a subsequent pipeline would be sited within the same ROW. Under this arrangement, cumulative land use impacts would be avoided or minimized. A possibility of cumulative land use impact could occur in the Kenai River Flats area where separate gas transmission lines corridors could be established for collecting gas from new producing gas fields. The unitization of the gas transmission lines or a requirement of a common ROW corridor by landowners and pipeline regulators could minimize this possible cumulative effect.

No cumulative adverse land use impacts from the proposal are anticipated upon the industrial land uses of the Nikiski area.

The postulated oil pipeline from Cape Chernof to Talnik Point and the marine terminal postulated at Talnik Point are unlikely to be accompanied by additional land development. The facilities would be located in a remote area. If commercial quantities of hydrocarbons were discovered in the Shelikof Strait from some hypothetical lease sale. If the find is made within an economic pipeline distance of the Talnik Point terminal, then the pipeline would be routed in the same ROW onshore and it would use the postulated terminal at Talnik Point. Other land use development at the Talnik Point area and along the pipeline ROW is not foreseeable. The one possibility of cumulative adverse impacts upon land use in the Cape Chernof to Talnik Point area would be commercial timber harvesting operations which would be undertaken by the Afognak Native Cooperation. However, the land use impacts of the submerged pipeline with minor land clearance are likely to be less than those associated with commercial timber harvesting operations.

Spillover land use impacts in the communities of Soldotna, Homer and Port Lions could be accompanied by additional land development which would cumulatively and adversely impact local land use. Local and State public policies and planning provide a statisfactory means for controlling land use development and potential adverse impacts. Hence, the possibility of cumulative adverse "spillover" land use impacts could be effectively mitigated through application of public policies and planning programs.

Unavoidable Adverse Effects: No unavoidable land use impacts are anticipated from the postulated petroleum development scenario. The land use impacts associated with the scenario and discussed above are amenable to site planning, land use regulations, etc., which renders the impacts avoidable rather than unavoidable.

m. Impacts on Transportation Systems: The following section will contain an analysis of the impacts, resulting from the proposal and other actions interrelating with the proposal, on the transportation systems of the

affected areas. The analysis will be organized so as to describe perceived impacts on each of the affected geographical areas according to the stage of industry activity, i.e., exploration, development, and production.

In order to extrapolate likely transport impacts it will be necessary to organize the logistics flow of industry activity along some reasonable modal linkage. Industry activity during the previous sale CI has provided some indication as to how the transfer of workers and material will be accomplished in relation to sale 60.

In sale CI (which has not progressed beyond the exploratory period) the majority of workers and material were brought through Anchorage and then, respectively, flown or trucked to bases on the Kenai Peninsula. This scenario will be followed in the analyses contained in this section. However, it should be kept in mind that timely and significant improvements in the harbor capacity of the city of Homer would render it, from an economic point, a much more viable entry port.

In this analysis Port Lions will be viewed as an ancilliary to the Kenai support bases and will function primarily as an air support base. The Port Lions base will throughput mainly workers and foodstuffs and an overall quantity of material small in relation to the total effort.

Kodiak Island Exploratory Period

Impacts accruing to Kodiak Island transportation systems as a result of sale 60 exploratory activity whould be minimal, except in the Port Lions where moderate impacts from the expansion of the airport could be expected. Initial air and sea support operations for the entire sale area will issue from bases located on the Kenai Peninsula. In the event that a commercially recoverable hydrocarbon reservoir is located within the Shelikof Straits a forward air support base may be constructed at Port Lions. Miller Airfield, and to a lesser degree Kodiak Airport, may also be used for industry activities.

Impacts on the Air Mode: Utilization of the airfield at Port Lions would only be possible after the lengthening of the runway surface, the installation of navigational aids, the construction of hanger and warehouse facilities, and the construction of a helioport. The physical nature of the terrain surrounding the Port Lions airfield would allow the airfield to be expanded some 305 meters (1,000 ft) on land. The remaining 457 meters (1,500 ft), or more necessary to expand the field to allow its use by larger aircraft, could only be acquired by extending the runway into Kizhuyak Bay. There is sufficient flat land around the field to allow construction of a small complex of storage facilities, hangars, helioport, and living quarters.

Miller airfield and Kodiak Airport are two facilities which could provide air support bases for Shelikof operations. Miller Airfield, located on Cape Chiniak, is a former U.S. Air Force Base. It has been closed to the general public since 1971; however, it is now in private ownership. Use of Miller Airfield would require the extension and resurfacing of its runway facilities, as well as the refurbishing of its hangar and storage facilities. Kodiak Airport, if used at all, would function primarily as a personnel and freight transfer point. It is not envisioned that any facilities would have to be built at Kodiak Airport during the exploratory period.

Freight and personnel traffic arriving by air, to Kodiak support bases, would average, during the exploratory period, some 150 people and 8.07 metric tons (8.9 tons) of freight per month. The tonnage would represent foodstuffs, medicines, and other perishable items to be used by support base personnel. The amount of flights which would be caused by this traffic would be dependent entirely on the type of aircraft employed. Assuming that passengers are transferred at Kodiak Airport from jets to smaller aircraft (i.e., twin otters or large helicopters) and freight is brought directly to the support base some 12-15 flights per month could be expected to arrive at the Port Lions airfield. Helicopter flights from Port Lions to the exploration platforms are expected to number 60-90 per month.

Impacts on the Land Mode: Impacts occurring to the land transport systems of the Kodiak Archipelago, during this period, are expected to be insignificant. No continuous heavy truck traffic or overland passenger movement should occur.

Impacts on the Marine Mode: Marine transport impacts are expected to be only minor in nature. Some barge traffic would be required to transport equipment and construction materials necessary to upgrade the facilities at the air support bases. The barges would be no more than two or three in number. The unloading of these barges at either the Wakefield Cannery dock or a dock in Chiniak Bay would cause very short-term space use conflicts with the local fishing industry. As a result of the need to extend the Port Lions Airfield, somewhat more extensive impacts may be expected in that township. Barges carrying rock fill and armour rock will cause an approximate three or four month disturbance to fishing activities which occur in the vicinity of Port Lions.

Kodiak Island Developmental Period

In this period the probable focus of induced transportation system impacts would be the area in and around the city of Port Lions.

Impacts on the Land Mode: Due to the need to transport workers and material to construction sites, a road may be built from the terminus of the present road at the Port Lions airport to the oil terminal site at Talnik Point, and then along the pipeline corridors. This construction road would total 21 km (13 mi) and would have to be constructed before other onshore activities could commence.

Impacts on the Air Mode: By the beginning of the developmental period construction activities involving the Port Lions airfield would be completed. Incoming freight and passenger volume for the peak development year 1986 would total some 700-750 workers and approximately 41-45 metric tons (45 tons) of perishable commodities per month. The aforementioned traffic would involve 60-70 flights per month into the Port Lions airstrip. Heliocopter flights to the Shelikof Platforms from the Port Lions field should total some 90-120 flights per month.

Impacts to the Marine Mode: In the developmental period, at least 5 barges (2,000 short ton class) are expected to off load at the Port Lions Dock. These barges will contain such items as living quarters modules, onshore pipeline, construction machinery and materials. Additional marine traffic would be generated by barges carrying armour rock (the source of the armour

rock could be Kizhuyak Point) for the construction of a breakwater for the Talnik Point facility and by petroleum barges carrying helicopter fuel. The barges transporting the armour rock would dump their freight directly on site.

Due to the barge traffic space use conflicts between the fishing and oil industry could occur at the Wakefield Cannery dock. Such conflicts would intensify during periods of peak fishing activity, but would terminate upon the completion of the Talnik Point oil terminal dock. Additional conflicts could occur due to the reduction of fishing opportunities in those areas which lay in the barges' traffic path.

Impacts Arising as a Result of Production Activities

During the production phase, passenger numbers and freight tonnage should decline markedly from that of the development period. As a result of this reduced volume of incoming traffic impacts on the land, air, and water transport systems would also be reduced.

Vehicle traffic levels within the Port Lions area should fall to levels only slightly higher than those experienced during the pre-exploratory period. Vehicle levels above that which would be generated by local inhabitants would derive from freight traffic passing to and from the airport, pipeline service vehicles, and local trips by terminal personnel. Air traffic levels would be similarly diminished. Some 400-450 passengers and 21-24 metric tons (23-26 tons) of perishables could be expected to be deplaned at Port Lions during the average year of the production phase. This could translate itself to 24-39 flights per month into the Port Lions airport. Helicopter flights from the support base to the rigs could occur at a rate of 60 per month.

Marine impacts in the Port Lions area, during the production phase, are expected primarily in the form of tanker traffic passing to and from the Talnik Point facility. According to table II.B.1.a.-1 some 96.8 mmbbls of oil would be transported during the peak year from the sale 60 area. Half of this amount could be expected to be from the Talnik facility, using a carrier of the 100,000 dwt capacity, as a yardstick, it may be assumed one tanker would leave from Talnik Point every 6 days. The tankers would enter Kizhuyak Bay from the Gulf of Alaska via Marmot Bay. Fishing activities (especially crabbing) occurring in the path of the tankers could be disturbed; however, many of the conflicts could be avoided by observing a standard shipping schedule and a voluntary shipping lane.

Port Lions and/or Talnik Point is not viewed as having a role in providing marine support and supply activities in any of the three phases. Marine support vessels which might issue from Talnik Point would be infrequent, and probably due to emergency causes. The reason for this assumption is the treacherous nature of the climate and oceanography of Whale Passage (see section III.C.6.a). The navigational uncertainties are such that a timely and rigorous supply schedule, especially during the fall and winter months, could not be maintained without the acceptance of some risk.

Anchorage

Impacts which may occur to the transportation systems of Anchorage and the Kenai Peninsula would be entirely within the developmental phase of oil and gas activity.

Table IV.A.2.m.-1
Bulk Tonnage Transportation Requirements
for the Proposed Action

Year	Tonnage in Short Tons: Pipeline[1]	Drill Casing and Drill String[2]	Mud and Cement[3]	Transportation -per year-: Freighter[4]	Barge[5]	Truck Trips[6]
1985	57,420	---	---	5	29	3222
1986	75,240	10,511	13,584	9	50	5555
1987	25,740	17,287	19,355	6	32	3479
1988	---	17,037	18,681	3	17	1889
1989	---	17,037	18,681	3	17	1889
1990	---	17,037	18,681	3	17	1889
1991	---	406	445	---	---	47

1/ Assume 184 lbs per foot for oil. Assume 116 lbs per foot for gas. (USGS/BLM-OCS, 1980.)
2/ Northern Resources Management, 1980.
3/ See Appendix A.
4/ Based on Sealand's standard containerized freighter class, the C-4 x 3 series.
5/ 2,000 ST Barges.
6/ 36,000 lb tandem rigs. One way trips.

As a result of sale CI, the corporations, involved in exploratory activities, have stockpiled significant amounts of mud, cement, and tubular goods on their Kenai staging yards. Due to this material surplus, the oil industry expects to be able to effect all sale 60 exploration without the importation of auxiliary supplies. Additional material would only be brought in as a result of the location of commercial quantities of hydrocarbons (Northern Resources Management, Monitoring Exploration Activities in the lower Cook Inlet, 1980). In the light of this fact, it is perceived that impacts on either the Anchorage or Kenai Peninsula transport links, derived from exploratory activities, would be entirely due to the transfer of workers and perishable commodities. Worker/passenger figures and tonnage devoted to foodstuffs would be similar to those entering Port Lions during this same period. Whereas, such a volume of traffic would cause a measureable impact on the Port Lions systems; it is believed that the forecast level of exploratory activity could be absorbed by the transport systems of the subject areas without significant affect. For this reason, the discussion of impacts accruing to the transport systems of Anchorage and the Kenai Peninsula will commence with the developmental period.

Impacts Arising as a Result of Developmental Activities

A review of table IV.A.2.m.-1 reveals that 1986 is the year in which the maximum tonnage of mud, cement, and tubular goods would be brought into the State. A review of table B-4 also indicates that this same year would be also the one which may experience maximum sale 60 related employment.

Impacts to the Land Mode: Truck traffic generated by sale 60 related freight arriving at the Port of Anchorage would equal some 15 trips per day (30 round trips). In view of 1979 AADT (see table III.C.6.c.-1) and the recent improvements rendered to the Seward highway, south of Anchorage, truck traffic issuing from the Port of Anchorage would register no more than a minor impact to the road system.

Impacts to the Air Mode: Peak passenger/worker numbers would, during 1986, average some 900-950 individuals per month. This assumes that all labor is exogenous in origin. Such a labor force would generate as many as 50 flights per month from the Anchorage terminal. Given the carrying capacity of Anchorage International Airport, as outlined in section III.C.6.b., it is unlikely that proposed action would create any significant impacts on airport operations.

Impacts to the Marine Mode: In 1986 the total tonnage engendered by the proposed action and passing through the Anchorage Port would equal some 98,000 tons. This tonnage is equivalent to 6 percent of the total cargo and 10 percent of the dry cargo handled by the Port of Anchorage. Total ship arrivals at the Port of Anchorage, at the peak of development, would vary according to mix of vessels used. A review of table IV.A.2.m.-1 reveals that use of containerized freighters would reduce the sale 60 traffic to some 4 percent of the freighter traffic experienced by the port in 1979.

Impacts Arising as a Result of Production Activities

During the production phase of OCS activities total tonnage handled, vehicle traffic generated, and passengers transferred are expected to be an insignificant level when measured against the total Anchorage transport system.

Cook Inlet

Impacts Arising as a Result of Development Activities

Impacts on the Land Mode: As a result of the proposed action, some 15 round trips per day by fully loaded tandem rig trucks could be expected on the Kenai Peninsula road system. A review of table III.C.6.c.-1 indicates that these additional trips would not significantly impact the total AADT for any affected road link. The truck traffic, if properly scheduled not to compete with peak hours of commuter or recreational traffic, would have little impact on the carrying capacity of the Kenai road system except to increase the long-term deterioration factor to which the Sterling Highway is exposed. However, should the material be transportated in surges rather than a steady flow, localized traffic congestion could be expected to occur around the Anchor Point construction site and near areas of prime recreational interest. It is assumed that any potential for traffic congestion would be limited to the summer months.

By 1986, significant vehicular traffic could be generated by the extensive hire of local citizens. A vigorous policy aimed at employing residents of Homer and Kenai would reduce impacts on the air transport systems by reducing the need to transport and exogenous work force. At the same time such a policy would result in further increase of the Sterling Highway AADT levels.

Impacts to the Air Mode: Assuming that either the airport at Homer or Kenai received the full brunt of an exgenously derived workforce (some 50 flights and 950 individuals per month), the ability of these airports to function properly would not be impaired. Although parking space, terminal facilities, and storage facilities for both airports are limited, it is expected that any OCS-related traffic would be promptly transhipped to its destination. In any event a review of section III.C.6.c. will evidence the fact that both Homer and Kenai have drafted airport expansion plans which should accommodate any proposed OCS development activity.

Helicopter support flights from logistics bases at Nikiski and Homer could total 120 flights or more per month.

Impacts to the Marine Mode: All mud, cement, and tubular would be shipped from bases located either in Kenai or Homer. Support boats transiting between the supply bases and offshore platforms are expected to average between 90 and 120 round trips per month during the peak of developmental activities.

No additional docks are expected to be built at Nikiski as a result of this proposed action; however, a one or two dock complex would be built at the Anchor Point terminal. Additional dock facilities would have to be constructed at Homer in order to facilitate any hypothesized logistics traffic. In regard to Homer, a port development plan has already been discussed and outlined in section III.C.5.

Impacts Arising as a Result of Production Activities

During the production period logistics vessels would make some round trips per month. Oil tankers of the 100,000 DWT class will be expected to complete one trip every 6 days. This volume of tanker traffic would be expected during the

maximum production period (1991-1993) and would be equal to 8 percent of all tanker/freighter trips registered in the Cook Inlet in 1977. Vessel trips required for carriage of LNG are expected to be part of the volume generated by the proposed Pacific LNG facility. Additional traffic from the proposed plant could be triggered by gas extracted as a result of the proposed action. The traffic flow from the proposed LNG plant, as well as its interrelationship with the proposal will be treated in this section under the heading of cumulative effects.

Impacts from the proposed action to the land and air modes would sharply decline during this phase and would reach insignificant levels when measured against the total traffic volumes of the Kenai Peninsula transport systems.

Conclusion: Impacts resulting from the proposal to all transport modes serving the town of Port Lions would be significant. Because of its undeveloped status, Port Lions would receive the greatest relative impact from the proposed action. The rate of traffic which Port Lions could receive during the least active of the OCS phases, that of production, would be substantially above levels currently experienced by the city.

Maximum conflict between OCS and Port Lions fishing activities are expected to occur during the developmental period. The potential conflicts will entail the temporary loss of fishing grounds in Kizhuyak Bay due to large traffic and construction activity. Space use conflicts should subside. However, loss of fishing grounds in the vicinity of Talnik Point, over the life of the proposal may result from this action.

Impacts to the transport system of Anchorage are seen as minor to insignificant for all phases of sale 60 activity except for the Port of Anchorage. Moderate impacts could be assumed for the Port of Anchorage during the development period due to a 6 percent increase in total cargo (over 1979 figures) handled and a possible substantial increase in barge traffic.

Impacts accruing to the Kenai transport systems would be minor to moderate in nature throughout the life of the proposal. The existing capacity of the Kenai and Homer airports would be adequate to manage all air traffic occurring in any phase of activity. Highways would suffer peak impacts during the developmental period. Localized congestion may occur from the poor timing of truck convoys and from commuter traffic. However, any congestion which would happen should be limited to summer months. Marine transport impacts are expected to be moderate in nature. Tanker traffic in the inlet would be increased by some 8 percent over 1977 levels.

Cumulative Effects: The expansion of the Port Lions small boat harbor should be complete by the developmental period of the proposal. In the event that both the boat harbor and the construction projects associated with sale 60 occur within the same timeframe, significant short term impacts could arise. Fishing vessels would have to compete with barges carrying armour rock, supplies, construction material, and rock fill. Congestion would probably occur and fishing activities within the vicinity of the construction projects would be sharply curtailed.

Spacing the projects so as to allow one to be completed before the commencement of another would do much to alleviate a potentially hectic and congested construction period.

The transportation systems of the city of Anchorage are such that each one of the proposed projects outlined in section IV.A.1.h. would individually at most create a minor to moderate impact. To significantly impact Anchorage, all of these projects would have to have their peak construction activities occur within or near the same year.

In regard to the Kenai Peninsula, the proposed action may be just one of a series of projects which will affect the peninsula throughout the 1980s. Successful drilling operations would ensure the continuing increase in use of Kenai Peninsula transport systems. This increase is ongoing and is expected to continue throughout the 1980's with or without the proposal.

A significant aspect of the proposed action may be an expansion of the envisioned Pacific Alaska LNG plant. The location of large reserves of natural gas may cause the emplacement of a third liquefaction train to the Pacific Plant. The third train would raise the liquefaction potential of the plant to some 600 mmcf per day and concommitantly increase the yearly number of LNG vessels issuing from the facility from 60 to 90 per year.

Total tanker traffic caused by the proposed action may equal some 90 oil and LNG vessel trips per year. Tanker traffic generated from all other projects (see section IV.A.1.h.), with the exception of the lower Cook Inlet sale, could equal 120 trips per year.

Projected tanker traffic produced by sale LCI is difficult to estimate. The volume and range of tanker traffic which may result from sale LCI extends from 0 to more than twice that generated by the proposed action. Original resource estimates for sale LCI ranged from 900 MMbbls of oil to 2.8 Bbbls of oil. However, the continuing lack of success registered by exploratory drilling within the inlet has called the original resource estimates into doubt. As it stands, the inlet is due one more drilling effort and then oil industry action is expected to cease.

In short, with the exception of possible traffic from sale LCI, the proposal would be responsible for 30 to 40 percent of all tanker traffic generated during the next decade by presently proposed projects.

Unavoidable Adverse Effects: The unavoidable adverse impacts which may derive from sale 60 related activities are: 1) a substantial and permanent increase in the traffic volume experienced by all modes serving Port Lions; 2) short-term space use conflicts between fishing and OCS vessels; 3) loss of some fishing grounds in the vicinity of Port Lions over the life of the proposal; 4) localized traffic congestion on the Sterling Highway near construction areas; and 5) increase of tanker traffic in the Cook Inlet, Marmot Bay, and the Gulf of Alaska.

n. Impacts on the Alaska Coastal Management Program: Impacts of the proposal on the Alaska Coastal Management Program (ACMP) can be effectively identified and evaluated through the consistency provisions of the Federal Coastal Zone Management Act as amended (CZMA)(16 USC 1456, et. seq.). Refer to section I.D of this EIS for an explanation of the CZMA consistency provisions as they apply to the OCS leasing program.

Kenai Peninsula Borough-District Coastal Management Program: The proposal is not expected to adversely effect the integrity of the District Coastal Management Program (CMP). The borough's program is being developed and is expected to be approved by the State legislature in January, 1982. If the proposed lease sale occurs in September, 1981 as scheduled, then it will have occurred before the borough's CMP is approved by State.

In the absence of an approved district CMP for the Kenai Peninsula Borough (KPB), some assumptions can be made in this EIS to provide for an impact assessment of borough energy facility siting policies. It should be recognized the following analysis does not constitute a) a consistency determination under provisions of the ACMP or, b) an impact assessment of proposed OCS related onshore facilities in the borough's coastal zone. Instead, the assessment is of petroleum development scenario assumptions accompanying this leasing proposal against hypothetical energy facility siting policies of a KPB-CMP.

Assume that a) the energy facility siting policies of KPB sponsored studies mentioned in section III.D.2.d above are officially incorporated into the borough's CMP and that, b) the district CMP is adopted by the State legislature. The proposal's onshore facility siting scenario for an exploration case and a development case for commercial finds of hydrocarbons is identified in section II.B.1.a. A comparison of this section and section II.B.1.a. shows that the siting scenarios of the proposal and the assumed policies of the borough CMP are compatible. Specifically:

> The proposal assumes exploration support activity will occur out of Nikiski and Homer on the Kenai Peninsula. These facility locations have been identified in borough sponsored studies as suitable for serving energy development needs.
>
> The proposal assumes an oil terminal and processing facilities at Anchor Point-Cape Starichkof. This is consistent with borough sponsored studies which have identified this area as suitable for a deep water port and OCS related industrial development.
>
> The proposal assumes a gas pipeline extending from an offshore pipeline landfall (between Cape Starichkof and Anchor Point) to the present liquefaction facilities at Nikiski. This aspect of the proposal is not reflected in the borough sponsored studies. Hence, the gas pipeline part of the scenario could be considered inconsistent with the findings of the borough studies. However, these studies did not address the issue of pipeline transportation, generally, as witnessed by the lack of discussion of existing oil and gas pipelines in the upper Cook Inlet and on Kenai Peninsula.

Kodiak Island Coastal Management Program: The Kodiak Island Borough (KIB) CMP is in the same situation as the Kenai Peninsula Borough program; it is in progress, has yet to be completed, and the proposed lease sale is expected to occur before the program would be officially adopted by the State legislature. The remarks above about the proposal's lack of adverse effects on a developing district CMP apply equally to the KIB as to the KPB.

The petroleum development scenario accompanying the proposal includes a submerged pipeline through the Kupreanof Strait with the pipeline landfall at Cape Chernof, an onshore pipeline from Cape Chernof to Talnik Point on Kodiak Island, and an oil terminal at Talnik Point. Port Lions could function as a logistical support center and provide infrastructure for the terminal and/or processing facility operations at Talnik Point. See section II.B.1.a of this EIS regarding scenario assumptions and descriptions.

The consistency of the proposal's petroleum development scenario with energy facility siting policies of a KIB district CMP could be hypothetically evaluated, similar to the evaluation above for the Kenai Peninsula Borough. However, deriving energy facility siting policies from KIB's sponsored studies is more difficult for the Shelikof Strait portion of the proposed sale area: The borough's one study on oil terminal and marine service base sites (Woodward/ Clyde Consultants, 1977) was predicated on a western Gulf of Alaska rather than a Shelikof Strait lease sale. The borough acknowledges that its siting must be updated to include the Shelikof Strait and Chiniak Bay areas for proposed OCS sale 60: It has submitted applications for funding assistance under the Coastal Energy Impact Program for new facility siting studies in the Shelikof Strait and Chiniak Bay areas.

For the KIB, some goals and objectives statements have been adopted as official policy. The KIB policy statements call for OCS-related facilities to be sited away from the "population centers of Kodiak Island" and "be self-sustained at their remote sites." Refer to section III.D.4.b. above. Based upon these policy statements, the Shelikof Strait petroleum development scenario could possibly be considered inconsistent with KIB hypothetical energy facility siting policies, as it hypothesizes the location of facilities near populated areas.

The marine terminal is proposed at Talnik Point, which is only 3 miles from Port Lions, and approximately 1 mile from the Port Lions airfield. The Port Lions community and its infrastructure could be used to support the oil terminal operations. However, this interaction and possible adverse impact on Port Lions could not be determined until an OCS lessee submits a petroleum development plan after a commercial find of hydrocarbons (oil) in Shelikof Strait. Moreover, it is unclear whether the borough policies identified in section III.D.4.b. refer to outer lying settlements such as Port Lions.

Proposed Area Meriting Special Attention: Section III.D.3.b. and c. identifies a proposal for Area Meriting Special Attention (AMSA) designation under the ACMP in the Kenai River Plats AMSA proposed by the USFWS and ADF&G. The AMSA has not been officially acted upon by the Alaska Coastal Policy Council. There is no specific coastal management policy authorized for the proposed AMSA area beyond the general policies and standards of the ACMP.

Assuming the proposed AMSA's were adapted by the Alaska Coastal Policy Council, the siting of a gas pipeline through the Kenai River Flats area could pose a moderate impact. If the pipeline were sited through the AMSA "Natural Area Zone," this would have to be designed and constructed in a manner compatible with USFWS recommendations (U.S. FWS, 1979). The FWS AMSA proposal would allow "oil and gas operations" in this zone. Refer to figure III.C.5.c.-2 for a delineation of this zone. This EIS presumes that a buried gas transmission line would qualify as "oil and gas operations" under the U.S. FWS AMSA proposal.

Alternatively, the gas pipeline could be sited in a corridor to the east of the proposed AMSA "Natural Area Zone;" such a corridor would obviate any impacts upon an adapted AMSA which was incorporated into the approved ACMP.

Both the Kenai Peninsula Borough (KPB) and the Kodiak Island Borough (KIB) CMP's, will likely be incorporated into the State ACMP before significant post-lease sale activities requiring Federal consistency review.

Conclusion: The proposed lease sale would have no adverse impacts on the approved ACMP. The proposal would not adversely effect the proposed Kenai Peninsula Borough CMP and the Kodiak Island Borough CMP.

In the case of the KPB, the proposal's development scenario appears to be in line with sites identified in KPB's sponsored studies. However, the proposal's scenario for an oil terminal at Talnik Point could conflict with and adversely affect adopted KIB goals and objective statements on OCS facility siting.

Cumulative Effects: Cumulative effects upon the State ACMP are difficult to identify because of the orientation of the State program and the absence of an approved district CMP for either the KPB or the KIB. Other major projects identified in section IV.A.1. will, for the most part, affect the Kenai Peninsula Borough rather than the Kodiak Island Borough. These projects could be considered to not cumulatively and adversely affect the KPB District CMP because the coastal management program is designed to provide for suitable developmental uses of the coastal zone. Thus, the determination of cumulative adverse effect of these other major actions turns on their suitability as land and water uses in the KPB coastal zone. This determination is beyond the scope and authority of this proposed leasing action.

One possibility for cumulative adverse effects upon a KPB district CMP is various development activities proposed for, or impacting on, the Homer Spit and land/water environs in Kachemak Bay. The utilization of the Port of Homer for an OCS exploration and development support center, in conjunction with other developmental uses (e.g., bottomfisheries development, general goods movement, recreation and commercial fishing vessel moorage and transit, the Bradley Lake hydroelectric project), could cumulatively and adversely affect the Homer Spit portion of the coastal zone. However, an "Area Meriting Special Attention" designation under the ACMP could provide satisfactory mitigation, through management practices, to the several development proposals for the Homer Spit.

Unavoidable Adverse Effects: The leasing proposal would not likely result in any unavoidable adverse impacts upon either the Alaska Coastal Management Program, the Kenai Peninsula Borough District CMP, or the Kodiak Island Borough CMP.

o. Impacts on Water Quality: Environmental impact assessment of drilling fluid disposal upon marine receiving waters has been described in the appendices to three separate EISs: FEIS on OCS sale 65 (BLM, 1978), Final Supplement on the EIS on OCS sale 42 (BLM, 1979), and the FEIS on the proposed Five Year OCS Oil and Gas Lease Schedule (BLM, 1979). These appendices are incorporated by reference to this section on water quality impacts pursuant to CEQ regulations implementing NEPA (40 CFR 1502.21; 43 FR 55978).

Types of Wastewater Discharges

Drilling Muds: Offshore exploratory and development well drilling involves use of drilling muds which are discharged periodically from the platforms. Quantities of discharged mud depend upon well depth, hole size, geologic formations encountered, mud dispersability, and solids control capability (API, 1979).

Because these parameters affect the discharge characteristics, it is difficult to define a "typical" mud system and discharge profile; however, available literature has been generated which describes different types of mud operations (EPA, 1976; EPA, 1977; Otteman, 1976; Dames and Moore, 1978; Ecomar, 1978).

Two major categories of contaminants in drilling muds are trace metals and bacteriocides (NOAA, 1979a; Adams, 1978; BLM, 1979). A third major pollutant category would be oil and grease, if an oil based mud system is used (EPA, 1976a).

Bacteriocides vary in terms of composition in drilling muds. These may include aldehydes, chlorinated phenols, quaternary amines, diamine salts, and other substances (Adams, 1978; EPA, 1977). The discharge concentrations of these compounds individually could range from 300 to 30,000 parts per million (ppm) depending upon the mix of bacteriocides in drilling fluids (EPA, 1977).

Produced Waters: If commercial finds of hydrocarbons are made in OCS sale 60, oil production from individual platforms will require separation of any formation waters or brines found in the petroleum bearing reservoir. The formation waters contain several toxic substances, both trace metals and aromatic hydrocarbons. The constituent toxic elements and their concentrations in formation waters vary with the geologic province encountered. A review of available data on typical formation water toxic constituents reveals that the Ni, Cu, Zn, and Ag metals exceed established Federal water quality criteria (Clark, 1979; Rittenhouse, et. al., 1969; EPA, 1975). The Offshore Operators Committee, upon reviewing available literature, found that only the metals Cu, Cr, Mn, and Sr appear to have concentrations in produced waters greater than that normally found in sea water (Sheen Technical Subcommittee, 1975).

Information on aromatic hydrocarbon concentrations in produced waters is difficult to identify. The Offshore Operators' Committee estimates that dissolved hydrocarbons may vary up to 50 ppm. The U.S. EPA Development Document for the New Source Performance Standards for the Offshore and Gas Extraction Category did not estimate dissolved hydrocarbons as a waste constituent in produced waters (U.S. EPA, 1975). Instead, the EPA estimated non-dissolved oil and grease concentrations. These vary from 7-1300 ppm in Lousiana offshore platforms and from 56-359 ppm in offshore California platforms.

Other Discharges: Offshore exploratory vessels and platforms routinely discharge treated sanitary wastes, ballast water, blowout preventor fluids, water distillation blowdown fluids, and deckdrain wastes. The rates of discharge vary with the size of the vessel or platform and the extent of drilling production and operations. The movement of OCS petroleum by tankers also results in ballast water releases which includes dissolved aromatic hydrocarbons. These ballast water releases were uncontrolled until recent years when requirements of the Clean Water Act, the Ports and Waterways Safety Act, and the Port and Tankers Safety Act imposed restrictions (see below).

Dilution and Transport Characteristics in Receiving Waters

Drilling Muds: Of the literature available on the fate and effects of drilling fluids in the marine environment, the topic of dilution, dispersion, and transport of mud contaminants in the water column has generally received greatest attention. Table IV.A.2.o.-1 summarizes data from representative field studies regarding dilution of drilling fluids in marine receiving waters. As summarized in table IV.A.2.o.-1, the continuous low level discharges of drilling fluids (10-20 bbl/hr) will dilute by factors of 10^4 (10,000:1) or 10^5 (100,000:1) within 200-300 meters of the discharge source. These dilution rates refer to total suspended solids or rhodamyne dye as a tracer. Background concentrations for suspended solids were reached within 100-280 meters. Few studies have actually monitored the trace metal contaminants in receiving waters of OCS platforms discharges (Ecomar, 1978; Endeco, 1976; Zingula, 1975). Of these studies, the trace metal dilution rates appear to be on the same order of magnitude of those for whole mud as measured by suspended solid concentrations.

Produced Waters: There is scarce information on the dilution and transport characteristics of the constituents of produced waters. Monitoring studies have been done to identify general water column chemistry around OCS waters, but inferences must be drawn as to the source of discharge. Comparison of the treated produced water constituent concentrations with applicable water quality criteria and background concentrations, where available, produces some estimate of the necessary dilution ratio. These dilution ratios can then be compared with the measured dilution properties in the two Cook Inlet rig monitoring studies.

Table IV.A.2.o.-2 displays the concentrations of various toxic substances, both trace metals and petroleum hydrocarbons, contained in treated produced water discharges. The discharges are from onshore production facilities serving several offshore production platforms in upper Cook Inlet. The level of produced water treatment provided at these facilities is comparable to that expected for treatment of produced waters from OCS sale 60. Discharge levels of most of the toxic trace metals are already close to the applicable receiving water criteria. However, some trace metals would need an order of magnitude (10^1) dilution. The aromatic hydrocarbon compounds sampled required at least one or two orders of magnitude dilution (10^1 or 10^2) in order to meet hypothetical water quality criteria for the individual hydrocarbon compounds.

Other Discharges

There is paucity of data on dilution and transport in marine receiving waters from routine low level releases of sanitary wastes, dissolved solids, and other pollutants discharged from offshore platforms. In the absence of evidence to the contrary, suspended solids and sanitary wastes are presumed to be diluted and transported in marine receiving waters similarily to whole drilling mud discharges discussed above. There is a paucity of data on dilution rates expected from routine low level releases of petroleum hydrocarbons from offshore platforms, aside from the discharges discussed above with regard to formation waters (Malins, 1977; EPA, 1976a).

Sedimentation: Several studies have been conducted of the trace metal accumulations in bottom sediments from drilling mud discharges associated with

Table IV.A.2.o.-1
Dilution Rates of Drilling Discharges from Offshore Oil and Gas Platforms [1]

Study Location	Discharge Specifications [1]		Dilution Characteristics [2]			Hydrographic Data [3]			Study Author
	Total Suspended Solids mg/l	Rate bbl/hr	Dilution Rate	Distance from Source	Distance to Background Level	Depth of Sampling	Prevailing Current (knots)	Ocean Depth	
Georges Bank, off New England	280,980	5.5	a. 7.4×10^4	10 m	10 m	0-150 ft	1.3 S	157 ft	Endeco, 1976
		16.5	b. 9.3×10^4	280 m	280 m	0-150 ft	0.8 N	157 ft	
S. Timbalier, Block 54, Gulf of Mexico	350,000	NA	a. 1.26×10^3	0	200 m	surface	NA	18.4 m	Zingula, 1975
		NA	b. 8.75×10^3	92 m	200 m	surface	NA	18.4 m	
		NA	c. 3.18×10^5	202 m	200 m	9.2 m	NA	18.4 m	
Tanner Bank, off southern California	250,000	10	a. 5.1×10^2	2.3 m	100-200 m	5-15 m	0.4 NW	63 m	Ecomar, 1978
		10	b. 4.8×10^4	100 m	100-200 m	5-15 m	0.4 NW	63 m	
		10	c. 1.2×10^5	200 m	100-200 m	5-15 m	0.4 NW	63 m	
Redoubt Bay, #1 Cook Inlet	60,000 ppb dye [4]	60	a. 1×10^5	38 m	NA [4]	1 m	6.8 (ebb)	122 m	NALCO, 1976
		60	b. 6.2×10^4	45 m	NA [4]	1 m	2.4(flood)	122 m	
		60	c. 8.2×10^5	600 m	NA [4]	1 m	NA(slack)	122 m	
		60	d. 1×10^5	500 m	NA [4]	12.3 m	variety	122 m	
Lower Cook Inlet	20,000	20	a. 1.5×10^3	100 m	100-200 m	7 m	0.6-1.91 NE	NA	Dames and Moore, 1978
		20	b. 2.5×10^4	200 m	NA	15 m	0.6-1.91 NE	NA	
	1.1×10^5 ppb dye [4]	20	a. 3.8×10^4	100 m	NA [4]	1 m	0.6-1.91 NE	NA	
		20	b. 1×10^5	200 m	NA [4]	1 m	0.6-1.91 NE	NA	

1/ Discharge specifications refer to whole mud concentrations with the exceptions of the Dames and Moore study which shows total suspended solid (TSS) concentrations after dilution by flushing water.

2/ Dilution characteristics describe the relative concentration of the suspended solids or dye at specified points in the receiving water column. The dilution rate represents the reported receiving water concentration divided into the concentration of TSS or dye in whole mud. Distance to background levels indicate the distance necessary for the effluent plume to mix with receiving waters to yield the natural or pre-existing concentrations of TSS.

3/ Hydrographic data provides some means of comparing the results of the plume dilution rates in different locations. Depth of sampling indicates the extent of the water column sampled as the basis for reporting TSS concentrations in receiving waters.

4/ The two Cook Inlet studies used rhodamyne dye, as a tracer for drilling mud plume dispersion. Because there is no natural background level for this substance in receiving waters, no distance to background level estimate is prepared.

Table IV.A.2.o.-2
Discharge Concentrations of Treated Production Waters
in Upper Cook Inlet and Necessary Dilution to Water Quality Criteria

Toxic[1] Substance	ARCO Granite Point Facility[2] Discharge Concentrations mg/l	ARCO Granite Point Facility[2] Dilution to[4] Water Quality Criterion	Marathon Trading Bay Facility[3] Discharge Concentrations mg/l	Marathon Trading Bay Facility[3] Dilution to[4] Water Quality Criterion
Trace Metals				
Silver	0.05	10^{-1}	0.03	10^{-1}
Arsenic	0.05	0	0.02	0
Cadmium	0.04	10^{-1}	0.28	10^{-2}
Chromium	0.14	0	0.57	10^{-1}
Copper	0.05	0	0.18	10^{-1}
Mercury	0.002	10^{-1}	0.0001	0
Nickel	0.05	0	1.1	10^{-1}
Lead	0.20	10^{-1}	0.2	10^{-1}
Antinomy	0.14	0	0.026	0
Selenium	0.01	0	0.017	0
Zinc	0.05	0	0.11	0
Petroleum Hydrocarbons[5]				
Benzene	1.3	10^{-2}	1.2	10^{-2}
Toluene	0.05	10^{-1}	0.48	10^{-2}
Ethylbenzene	0.05	0	NA	NA
Xylenes	0.10	10^{-1}	0.48	10^{-1}
Trimethybenzenes	0.50	10^{-1}	0.13	10^{-1}
Naphthalene	0.10	10^{-1}	0.16	10^{-1}
Methylnapthalenes	0.20	10^{-1}	0.15	0
Dimethylnapthalenes	0.50	10^{-2}	NA	NA
Trimethylnapthalenes	0.50	NA	NA	NA
Oil and Grease	4.2	0	2.0	0

[1] Toxic substances identified are those listed by U.S. Environmental Protection Agency pursuant to section 307(a)(1) of the Clean Water Act, as amended. Other metals exist in petroleum formation waters, however, these are not included in the list of toxic substances.

[2] The ARCO separation and treatment facility at Granite Point treats unprocessed petroleum liquids from platforms Spark and Texaco-Superior. Platform A and receives separate produced waters from Amoco and Mobile offshore production platforms. As of December 1979, the facility discharged an average 314,000 gallons (7476 bbl/day) of treated wastewaters.

3/ The Marathon separation and treatment facility at Trading Bay receives unprocessed petroleum liquids from Dolly Varden, Grayling, King Salmon, and the monopod platforms. As of December 1979, the facility discharged an average of 2,878,000 gallons (68.524 bbl) of treated wastewater a day.

4/ Dilution to water quality criterion refers to orders of magnitude reduction in the reported discharge concentration before it is less than or equal to the applicable U.S. EPA water quality criterion (U.S. EPA, 1976).

5/ There are no water quality criteria for individual aromatic hydrocarbon compounds Refer to section III.E. regarding water quality criteria for petroleum hydrocarbons. Hypothetical criteria have been derived from 96-hour LD50 bioassay work on first Instar zoeae (larval stage) of dungeness crab. A 0.01 decimal fraction of the reported LD50 value was used in accordance with U.S. EPA and Alaska DEC water quality criteria for petroleum hydrocarbons. Data source: Caldwell, Calderone, and Mallon in Wolfe, 1977.

Sources: Arco Oil and Gas Company, "NPDES Permit Application: Granite Point Production Facility," 1980. Marathon Oil Company, "NPDES Permit Application: Trading Bay Production Facility," 1980.

Table IV.A.2.o.-3
Trace Metals in Bottom Sediments Subject to
Offshore Oil and Gas Drilling Operations

Location	Trace Metal	Predischarge Levels [1] (ppm)	Post-Discharge Levels [1] (ppm)	Distance of Area Affected [2] (meters)	Author
Offshore Texas					
Flower Garden Bank	Ba	50-1,300	46-7,800	300	Marine Tech. Consulting, 1976
Baker Bank	Ba	344-419	678 max	1,000	Continental Shelf Assoc., 1976
			1,618 max	500	
Stetson Bank	Ba	609-658	803-2,763	300	Continental Shelf Assoc., 1976
South Texas OCS	Ba	100 max	500 max	NA	University of Texas, 1977
	Zn	65 max	200 max	NA	
	Cd	0.07 max	0.61 max	NA	
	Pd	7.6 max	20.5 max	NA	
Onshore Alaska					
Lower Cook Inlet	Ba	560-660	640-760	400	Dames and Moore, 1978
Offshore S. California					
Santa Barbara Channel [3]	Zn	68, 61	61, 61	240	Mearns and Moore, 1978
	Cu	14, 12	9.8, 9.8	240	
Tanner Bank	Ba	45-156	161-1,680	240	Ecomar, 1978
	Pb	0.60	0.76-9.9	240	
	Cu	0.70	0.5-6.11	240	

1/ Pre- and post-discharge levels of pollutants are derived from a secondary data source for the offshore Texas studies (BLM,1979). Hence, the characteristics of data collection may vary. Sediment data collected from sediment traps can be less than from grab samples (Ecomar, 1978). Also, some of the studies may have sampled "predischarge" values for trace metals through control locations during or after drilling discharges rather than actually sampling sediments before drilling operations commenced.

2/ Distance of area affected does not necessarily reveal the reach of sediment deposition from the offshore platforms. The distance figures instead reflect the sampling area (i.e., transect distance from the source), the distance to peak trace metal reported concentrations, or the distance to trace metal concentrations above the reported background).

3/ The Santa Barbara Channel study evaluated sedimentation rates from two different platforms. Trace metal concentrations shown by pollutant and by monitoring period represent the mean sample value of observations rather than the range.

offshore platforms and exploratory vessels operating in the Gulf of Mexico and offshore southern California (Marine Technical Consulting Services, 1976; Continental Shelf Associates, 1975; Continental Shelf Associates, 1976; University of Texas, 1977; Dames and Moore, 1978; Mearns and Moore, 1978; Ecomar, 1978; and NOAA, 1977). Summary results of these studies are presented in table IV.A.2.o.-3.

The studies clearly show a rise in sediment concentration of the trace metals listed. General patterns of increases in trace metals concentrations are not evident given the variables of particle size and composition, depth, circulation, velocity, and direction. However, the data in table IV.A.2.o.-3 does show an affected reach of particle deposition on the sea floor from the platform sources. The affected reach can be as small as 200 meters and as large as 1,000 meters. Two key factors affecting the distance of particle deposition on the sea floor are discharge depth from the sea surface and prevailing current speeds (Adams, 1978; Dames and Moore, 1978; BLM, 1979).

The elevated levels of trace metals found in bottom sediments can be at least three times the background concentrations if immediately below the drill rig (Marine Technical Services, 1976; University of Texas, 1977; Ecomar, 1978). Results from the second year (1977-78) of the four year EPA/NOAA environmental study of the Buccaneer oil/gas field in the Gulf of Mexico indicate there are trace metal gradients decreasing away from the platform structures in surficial sediments, and there are elevated concentrations of Ba, Pb, Sr, and Zn in surficial sediments within 180 meters of the structures (Anderson & Shwarzer, in press). The BLM New Orleans OCS Office sponsored investigations around twenty production platforms in the Central Gulf of Mexico, revealed that trace metal concentration gradients of Ba, Cd, Cr, Cu, Pb, Ni, and Zn decreased with distance from platform structures. Several species of shrimp, flounder, and snapper, as well as other fish and benthos were analyzed for trace metals, but no evidence of bioaccumulation was found (Tillery, 1979).

Drill cuttings are significantly cleaner than drilling muds since they are larger in particle size, thus providing fewer sorption sites per unit volume. Drill cuttings may accumulate on seafloors where bottom transport currents are low enough. However, in the case of the Cook Inlet COST well monitoring study, which occurred during swift current conditions, no cutting accumulations were discernible. Bottom sediment cores contained only 0.5 percent cuttings of the total core sample at 500 meters and only 0.2 percent cuttings at 100 meters from the discharge platform (Dames and Moore, 1978).

Petroleum hydrocarbons in bottom sediments have been subject to few investigations. An analysis of two producing platforms in the Santa Barbara Channel reveals elevated levels of total hydrocarbons in the bottom sediments around the platforms. However, the authors infer that the major source of petroleum hydrocarbons sediments are from natural oil seeps in the channel rather than from platform discharges (Mearnes and Moore, 1976).

OCSEAP sponsored reasearch has reported on suspended and surficial sediment concentrations of hydrocarbons in the Cook Inlet and Shelikof Strait areas (Cline, Bates, and Katz, 1980). The sampling stations were not located in upper Cook Inlet near production platforms. The sampling results typically showed odd carbon numbered alphatic hydrocarbons indicative of terrigenous sources, with exceptional stations showing hydrocarbon of marine planktonic

sources. None of the hydrocarbon sediment sampling indicated anthropogenic or petrogenic hydrocarbons sources. Total saturated hydrocarbon concentrations sampled were in the low ppm (0.7 to 8.4 ug/g) across all sampling stations.

Conclusion: OCS exploratory vessels and platforms would be discharging drilling fluids in bulk quantities, along with low levels of petroleum hydrocarbons, sanitary wastes, and suspended solids from their wastewater discharge sources. Additionally, OCS production platforms would be discharging bulk quantities of formation waters. Releases of drilling fluids and petroleum hydrocarbons could kill and/or contaminate some species of fish and aquatic life within 1-100 meters of the discharge source. The exact distance of the affected receiving waters cannot be quantified without specific data on the discharge rate and oceanographic conditions in receiving waters around the discharge source.

Cumulative Effects: The discharged wastewaters from OCS operations on the Cook Inlet and Shelikof Strait could result in the eventual accumulation of trace metals and petroleum hydrocarbons in the water column and bottom sediments of the lease area. Refer to the discussion in section IV.A.2.b. regarding chronic effects of OCS discharges on marine biota. The cumulative loading of these contaminants from various sources besides OCS operations could deteriorate existing water quality. However, these effects may be localized to the location of the discharges.

Unavoidable Adverse Effects: The short term and cumulative effects of contaminant releases associated with OCS operations are avoidable. Control strategies can be devised to minimize the releases of contaminants, or to prohibit the release of contaminants, either by process removal, or in the case of drilling fluids, by the selection of less toxic or nontoxic drilling fluid components. Unavoidable adverse effects would include the possibility of chronic effects to marine biota from contaminant releases from offshore drilling and production operations.

p. Impacts on Air Quality:

Offshore Emissions Sources: Air emissions from OCS exploration, development, and production could be anticipated. Precise quantities of emissions by criteria pollutants, the location of emissions sources on the OCS, and the estimated onshore impacts on air quality are presented in this EIS. However, this air quality impact analysis proceeds from a set of assumptions which may not occur with the actual post sale exploration and production operations.

Representative air emissions have been compiled from an OCS exploratory vessel operating in the sale CI tracts and a production platform operating in State waters of the upper Cook Inlet. Emissions from Odeco's Ocean Bounty drilling vessel constitute the representative OCS emissions profile from an individual exploratory drilling operation (Phillips Petroleum, 1978). Emissions from platform Baker constitute the representative emissions profile from an offshore production phase operation (Dames and Moore, 1979). Emissions data from these two representative sources are shown in table IV.A.2.p.-1.

Simulated air quality concentrations have been calculated and are displayed in Table IV.A.2.p.-2 from these representative OCS emission sources. Several assumptions, which are explained in the footnotes, have been used in estimating

Table IV.A.2.p.-1
Representative Air Emissions Inventory
From an OCS Exploratory Vessel and Production Platform [1]

Criteria Pollutant [2]	Exploratory Vessel [4] gr/sec [3]	Exploratory Vessel [4] tons/yr [3]	Production Platform [5] gr/sec [3]	Production Platform [5] tons/yr [3]
Carbon Monoxide	2.71	94.33	3.77	131.10
Reactive Hydrocarbons	0.99	34.36	2.57	89.37
Nitrous Oxides	12.48	433.94	15.81	549.79
Sulfur Dioxides	1.07	37.05	3.27	113.65
Particulates	1.67	58.23	0.32	31.99

1/ The emission data are taken from specific facilities operating in OCS areas off Alaska. The emission rates are summed across all sources on the exploratory vessel or production platform.

2/ The "criteria pollutants" included here are those which are regulated by USGS authority on OCS emissions sources.

3/ Emission rates are expressed in either grams per second (gr/sec) or tons per year (tons/yr). The original data for both sources were expressed in instantaneous rate of gr/sec. These have been converted to ton/yr emissions for comparison against exemption provisions in the regulatory programs. A conversion factor of 34.775 was used which assumes constant daily operations of emission sources over a year.

4/ Source of emissions data is Odeco, Inc. Ocean Bounty exploratory vessel operating in Gulf of Alaska and lower Cook Inlet. (Phillips Petroleum, 1978).

5/ Source of emissions data is production platform Baker in upper Cook Inlet offshore reservoir near Kenai. (Dames and Moore, 1979.) Hydrocarbon emissions data were not available for platform Baker. Reactive hydrocarbon emissions estimated for a typical OCS production platform by U.S. EPA were substituted instead (U.S. EPA, 1977).

Sources: Phillips Petroleum, 1978; Dames and Moore, 1979; U.S. EPA, 1977.

Table IV.A.2.p.-2
Estimated Ambient Air Quality Concentrations
in Lower Cook Inlet Attributable to a
Typical OCS Exploratory Vessel and Production Platform 1/

Emission Source and Averaging Period 2/	CRITERIA POLLUTANT: CONCENTRATIONS (ug/m^3)				
	Carbon Monoxide	Hydrocarbons	Nitrous Oxides	Particulates	Sulfur Dioxides
Exploratory Vessel					
1-hour	Exempt	Exempt	2.0	Exempt	0.19
3-hour			1.8		0.17
24-hour			0.8		0.08
Production Platform					
1-hour	Exempt	Exempt	2.53	Exempt	0.56
3-hour			2.28		0.50
24-hour			1.01		0.22

1/ Ambient concentrations for the criteria air pollutants have been estimated for a minimum distance between OCS tracts in the proposed lease sale area and the shorelines of lower Cook Inlet and Shelikof Strait; this distance is approximately 5 miles. Ambient concentrations have been simulated through usage of a Gaussian plume model following guidelines of U.S. EPA air quality models (EPA, 1977 and EPA, 1978). Specific parameter values include the following:

Parameter	Exploratory Vessel	Production Platform
Effective Stack height	13.7 meters (45 ft)	11.35 meters (37.22 ft)
Stack Diameter	0.32 meters (1 ft)	0.53 meters (1.73 ft)
Average Wind Speed	7.6 meters/second (17 mph)	7.6 meters/second (17 mph)
Radiation	moderate to slight	moderate to slight
Stability Class	C	C

Meteorological information was compiled in lower Cook Inlet by OCSEAP-sponsored research (Reynolds, 1979). The stack height and diameter information was obtained from permit application for the exploration vessel and production platform respectively (Phillips Petroleum, 1978; Dames and Moore,1979).

Estimated ambient concentrations from either the exploratory vessel or production platform do not include background concentrations; baseline ambient air monitoring data for much of coastal Alaska is unavailable (EPA, 1978). Ambient concentrations attributable to the sources are estimated at the center line of the plume and at ground surface.

2/ The Gaussian model was calibrated to estimate 1 hour concentrations for the criteria pollutants emanating from the sources. Pollutant concentrations for 3-hour, 8-hour, and 24-hour averaging times were derived by conversion factors set forth in EPA air quality modelling guidelines (U.S. EPA, 1977).

the onshore air quality conditions displayed in table IV.A.2.p.-2. Key considerations in these assumptions are distance of the offshore source from the onshore receptor point and prevailing meteorological conditions. The assumptions collectively represent a worst case of a) the emissions source being located in an OCS tract nearest to the coastline, b) prevailing wind directions blowing towards the shoreline, and c) annual average wind speeds matching the worst case wind direction.

Other offshore emissions sources associated with OCS exploration and production are geophysical survey vessels, supply vessels, pipelaying barges, and other types of marine vessels servicing OCS exploration and development. Air emissions from these sources consist of exhaust combustion from engines and are considered insignificant (EPA, 1977; Battelle Pacific Northwest Laboratory, 1979).

Onshore Emission Sources: Possible onshore emission sources ensuing from OCS development would include a marine oil terminal, a liquefied natural gas (LNG) plant, loading operation of oil tankers and LNG vessels, processing facilities, and onshore facilities construction. The exact types of facilities, their location, and magnitude of operation cannot be predicted at this time. Refer to section II.B.1.a. for description of the petroleum development scenario.

Emissions and air quality estimates for a LNG plant proposed at Nikiski were prepared by Pacific-Alaska LNG Associates (Dames and Moore, 1979). Data on estimated maximum ambient concentrations from the Pacific-Alaska LNG facility are presented in table IV.A.2.p.-3. Unfortunately, no air quality simulations for a marine oil terminal operation of comparable scale to the proposal are available. There is an existing marine oil terminal at Drift River on the west side of the Cook Inlet. The emissions inventory for the Drift River terminal operation is comparable to that of platform Baker shown in table IV.A.2.p.-1. However, no ambient air quality monitoring has been performed at the terminal, nor is any simulated air quality analysis for the terminal available (personal communication, 1980).

A third category of onshore emissions sources ensuing from OCS development in Cook Inlet would be pumping stations for a gas pipeline extending from the coastal landfall to the liquefaction facilities at Nikiski. This category of onshore emissions would be insignificant.

Air quality impacts associated with the proposal, both offshore and onshore, should be evaluated in context of regulatory authorities and air quality standards: The applicable State and Federal air quality standards provide a basis for measuring air quality impacts, while the regulatory authorities provide mitigation measures for possibly significant air quality impacts.

Offshore emissions sources from OCS exploratory vessels and production platforms are subject of USGS regulations promulgated under the OCSLAA (43 USC 1334(a)(8); 30 CFR 250.2, 250.34-3, 250.57-1; 45 FR 15128). DOI's responsibility for regulating OCS emissions are discussed in section I.C. of this EIS.

Under the USGS program for regulating OCS air emissions, significant air quality impacts are defined in terms of a series of reviews:

Table IV.A.2.p.-3
Simulated Air Quality Impacts of Pacific-Alaska
LNG Facility at Nikiski

Pollutant and Averaging Period		Maximum Concentrations (ug/m^3)[1]			
		LNG Plant	Industrial Background	Natural Background[5]	Total[2]
Sulfur Dioxide	3-hour	80 (0.4,360)	558 (0.8,360)	20	578 (0.8,360)
	24-hour	37 (0.4,360)	223 (1.2,10)	20	248 (1.2,360)
	Annual	3 (0.4,360)	17 (0.6,360)	20	39 (0.6,360)
Total Suspended Particulates					
	24-hour	6 (0.6,30)	88 (0.4,30)	40	130 (0.4,30)
	Annual	0.4(0.6,30)	6 (0.6,360)	40	47 (0.6,360)
Carbon Monoxide	1-hour	197 (0.8,60)	NC[3]	1140	NC
	8-hour	60 (0.8,30)	NC	1140	NC
Nitrogen Dioxide[4]	Annual	11 (0.4,190)	11 (0.8,340)	20	38 (0.4,190)

[1] Locations of maximum concentrations relative to northeast corner of the LNG site are given in parentheses. The first number is distance in kilometers. The second number is direction in degrees measured clockwise from true north.

[2] Not equal to total of the natural background plus the maximum from the LNG plant and the maximum from industrial background sources because those maximums did not necessarily occur in the same location or at the same time.

[3] NC = Not calculated.

[4] Total NO_x as NO_2.

[5] Source: USEPA, 1978.

Source: Dames and Moore, 1979.

An initial determination is performed as to whether the OCS emission source generates a threshold level of emissions which warrants further investigation.

If the OCS emissions source is greater than the exemption threshold identified in (a) above, then an air quality assessment of onshore receptors must be performed. If estimated ambient concentrations onshore exceed specified "significant levels," then air emission controls are imposed under terms of the USGS rules.

A review of the representative OCS emission sources in table IV.A.2.p.-1 indicates that total hydrocarbons (THC), CO, and TSP can be considered insignificant and subject to exemptions pursuant to USGS rules. However, NOX and SO_2 would be subject of air quality analysis to determine if air quality "significance levels" were exceeded. The SO_2 emissions from hypothetical OCS production platforms (platform Baker) are marginally above the USGS exemption (100 tons/year).

The representative OCS emissions sources for SO_2 and NOX show that the significance levels for these pollutants would not be exceeded for averaging periods other than possibly an annual average value. The air quality simulations performed in table IV.A.2.p.-2, do not include annual average values, hence, a comparison with USGS significance levels for this exposure interval is not possible. The possibility of significant air quality effects for SO_2 and NOX from the representative offshore emission sources would be subject to USGS determined BACT emission controls. This requirement should mitigate any marginally significant SO_2 and NOX emissions from OCS exploratory vessels and production platforms.

Onshore air quality impacts from LNG operations, including loading of LNG vessels, would be insignificant if the gas liquefaction and loading of LNG occurs at either the Pacific-Alaska or Phillips LNG plant at Nikiski. The New Source Review and Prevention of Significant Deterioration (PSD) application of Pacific-Alaska LNG associates demonstrated that neither the State of Alaska air quality standards, the Federal NAAQS, nor the Federal PSD Class II increment maxima would be violated (Dames and Moore, 1979). An inspection of the standards in table III.F.-1 versus the incremental air quality effects attributed to the Pacific-Alaska LNG facility in table IV.A.2.p.-3 yields this finding. The air quality impacts of the existing Phillips LNG facilities at Nikiski are incorporated under the table IV.A.2.p.-3 as part of the "Industrial Background" emission sources.

Onshore air quality impacts from a marine oil terminal, including vessel emissions during the loading period, are not available. If a commercial find of hydrocarbons is made from OCS sale 60, the lessee(s) would submit an OCS development and production plan in which air quality effects of proposed facilities will be identified. In the absence of an air quality assessment of marine terminal operations ensuing from OCS sale 60, the current air quality conditions surrounding the Drift River marine oil terminal on the west side of Cook Inlet can be referenced. The State Department of Environmental Conservation (DEC) does not consider the Kenai Peninsula Borough portion of the Cook Inlet AQCR to be in violation of any State air quality standards; in particular, the Alaska Department of Environmental Conservation does not consider the Drift River marine terminal facility to be a major air emissions source under its State air quality stationary source regulations (18 AAC 50.300).

The onshore air quality impacts from gas pipeline pumping stations are expected to be insignificant assuming the imposition of any EPA designated BACT as air quality mitigation measures.

There is a PSD Class I area located on the west side of Cook Inlet; the Tuxedni National Wildlife Refuge. The nearest OCS tract proposed in sale 60 is approximately 12 miles from the nearest land segment of this EPA designated Class I PSD area. The air quality assessment in table IV.A.2.p.-2 from representative OCS exploration and production emission sources shows that the PSD Class I area allowable increments in table III.F.-1 are not likely to be violated. The air quality simulations in table IV.A.2.p.-2 do not include SO_2 and TSP estimates for annual averaging periods. On a statistical basis, however, the annual average value for SO_2 and TSP ambient concentrations would be less than the simulated 24-hour value shown in table IV.A.2.p.-2.

Conclusion: Air quality impacts from both offshore and onshore exploration and production operations would be insignifcant. No State and Federal air quality standards would be expected to be violated, and no EPA Prevention of Significant Deterioration allowable maxima for Class I and Class II areas would be expected to be exceeded. USGS BACT emission controls would be required for some major emission sources; these function as satisfactory mitigation measures to any potentially significant air quality impacts.

Cumulative Effects: Cumulative air quality effects from other major development actions, would likely be associated with marine vessel emissions and extractive minerals and coal industry operations. Other major developments would generate air quality impacts locally and would not contribute to regional air quality effects.

The only possible regional air quality effects would be photochemical oxidant and acid rain. There has been no documentation of the oxidant effect occurring significantly in southcentral Alaska. Oxidant forms occasionally in the Anchorage urban area in the summer months. However, the Anchorage area is in attainment status with a State ozone standard and the NAAQS oxidant standard. A PSD increment maximum for oxidant has not been established yet, and the State DEC has devised no control strategy for oxidant precursor emissions in the Cook Inlet southcentral AQCR.

At present, there has been no measurement of the acid rain effect occuring in southcentral Alaska. Some concern of possible acid rain effect upon national interest lands has been expressed, specifically in the Kenai National Moose Range on the Kenai Peninsula. The State DEC is proposing a monitoring study of the acid rain issue on the Kenai Peninsula to see if future developments warrant control strategies on SO_2 emissions.

Total suspended particulate (TSP) levels on the west coast of upper Cook Inlet are likely to be significant once major coalfield development occurs. However, stationary source OCS contribution to regional TSP levels will be insignificant in terms of cumulative effects. SO_2 and NOX emissions from increased tanker traffic in Cook Inlet will contribute to the emissions inventory for these two pollutants. It is difficult to anticipate the level of cumulative air quality effects for TSP, SO_2, and NOX because of the uncertainty of future development scenarios. There is the possibility, after 10-15 years of major development actions in the Cook Inlet, that TSP, SO2, and NOX levels will approach the PSD Class II increment ceilings.

Unavoidable Adverse Effects: Post-lease activities would cause various types of air emissions. Most of these emissions would be minor and short-term, and would not impact the onshore areas.

In case of a gas leak or a gas well blowout, methane pollutants would volatize quickly and drift away; or if a fire resulted, pollutants would consist mainly of carbon dioxide and water vapor.

If any oilspill resulted in fire, large amounts of particulate carbon and oxides of carbon, together with unknown amounts of sulphur oxides, nitrogen oxides, evaporated crude oil liquids, and partially oxidized compounds, would enter the air. Local air quality would be degraded during the period of the fire by the addition of the particulate matter. Mitigating measures would not totally prevent the above occurrences. The unavoidable result would be a localized temporary decrease in air quality which would vary with the magnitude of the incident.

3. Alternative II - No Sale: With this alternative, there would be no additional Federal leasing at this time in Lower Cook Inlet and Shelikof Strait. Federal leases already have been issued in lower Cook Inlet (sale CI, fig. II.B.1.a.-1), and oil from State leases in upper Cook Inlet passes through lower Cook Inlet.

a. Impacts on Vulnerable Coastal Habitats: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.a. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

b. Impacts on Commercial and Sportfish: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.b. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

c. Impacts on Commercial Fishing: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). It is estimated that the traditional commercial fisheries would not change greatly from what they are at present; catches would probably not increase much beyond what they are now. Prices paid for catches would likely increase, however. A major new bottom-fishery may develop which would increase numbers of fishermen, numbers and size of boats, and, perhaps, numbers of processors. Refer to section III.H.2. (Future Without the Proposal - Economy) for further discussion of the no sale alternative as it relates to commercial fishing. Refer to section IV.A.2.c. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

d. Impacts on Marine and Coastal Birds: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.d. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

e. Impacts on Marine Mammals: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.e. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

f. Impacts on Endangered Species and Non-Endangered Cetaceans: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.f. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

g. Impacts on Terrestrial Mammals: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.g. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

h. Impacts on Social Factors:

(1) Impacts on Population: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Cumulative impacts would be the same as base case population, shown in tables IV.A.2.h.(1)-1 and -3.

(2) Impacts on Sociocultural Systems: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.h.(2) for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

(3) Impacts on Community Infrastructure - Impacts on the Kenai, Homer, Kodiak, and Port Lions Areas: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.h.(3) for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

(4) Impacts on Subsistence: There would be no adverse impacts from oilspill contamination of subsistence resources, population pressure on resources, habitat destruction and associated noise, and other disturbances associated with construction of oil facilities and pipelines and oil and gas exploration other than those associated with existing petroleum activities in Cook Inlet. There would be no unavoidable adverse effects as a result of this alternative. Refer to section IV.A.2.h.(4) for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

i. Impacts on the State, Regional, and Local Economies: The economic situation under this no sale case is described in section III.H.3. Significant impacts, cumulative effects, and unavoidable adverse effects would occur only on the national economy as described in section II.B.2.

j. Impacts on Cultural Resources: This alternative would eliminate all significant adverse impacts on the terrestrial and offshore archeological and historic sites. The lack of impetus to survey and systematically collect cultural materials, due to the lack of a proposal, could result in less knowledge of historic and prehistoric cultures of the region. This is not viewed as a significant impact due primarily to the undesirable risks of salvage archeology. There would be no unavoidable adverse effects with this alternative. Refer to section IV.A.2.j. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

k. Impacts on Visual, Wilderness, and Recreation Resources: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.k. for more details with respect to cumulative effects.

l. Impacts on Land Status and Land Use: Under the alternative of no action, there would be no impacts or unavoidable adverse effects on land status and land use in the Shelikof Strait area. Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.l. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

m. Impacts on Transportation Systems: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.m. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

n. Impacts on the Alaska Coastal Management Program: With the no sale alternative, there would be no impacts or unavoidable adverse effects on the Alaska Coastal Management Program (ACMP) for the State of Alaska, or the district Coastal Management Programs (CMP) in progress for the Kenai Peninsula Borough and the Kodiak Island Borough. Refer to section IV.A.2.n. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.). Refer to the CI FEIS (USDI, 1977) for discussion of potential impacts from ongoing petroleum activities in Cook Inlet.

o. Impacts on Water Quality: With the alternative of no sale, there would be no impacts or unavoidable adverse effects on water quality in Shelikof Strait. Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.o. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

p. Impacts on Air Quality: Adverse impacts and unavoidable adverse effects could result from existing petroleum activities in Cook Inlet. Refer to the sale CI FEIS (USDI, 1977). Refer to section IV.A.2.p. for a discussion of the cumulative effects which could result from other projects (as described in sec. IV.A.1.h.).

4. Alternative III - Delay the Sale (153 blocks):

a. Impacts on Vulnerable Coastal Habitats: The delay the sale alternative allows more time for accumulation of site-specific environmental data for areas such as Shelikof Strait. The accumulation of specific data would influence primarily post-lease decisions (e.g., specific development plans such as platform placement, pipeline routing, and facility siting). The present amount of information has allowed adequate assessment of the impacts of exploration and possible major oilspills on coastal habitats in both lower Cook Inlet and Shelikof Strait. The impacts with this alternative would not be significantly different from those with the proposal (sec. IV.A.2.a.).

Conclusion: The impacts with this alternative would not be significantly different from those with the proposal (sec. IV.A.2.a.).

Cumulative Effects: The cumulative impacts with this alternative would be similar to those with the proposal (sec. IV.A.2.a.).

Unavoidable Adverse Effects: The unavoidable impacts would be similar to those described for the proposal (sec. IV.A.2.a.).

b. Impacts on Commercial and Sportfish: Delaying the sale could provide time to fill data gaps in the occurrence and distribution of commercial and sportfish species especially for Shelikof Strait. While habitats needs and the areas of fish species occurrence are generally known, determination of the importance of different habitat types and their relationship to fish population well-being could help in determining alternatives. This would be of more help in the Shelikof Strait area than lower Cook Inlet. Although delaying the sale would likely result in the same potential impacts as the proposal, these impacts could be better understood and perhaps avoided if the sale were delayed to allow for studies to better determine the habitat needs of fin and shell fish. Oilspill contingency plans could then include more specific information regarding fish habitats and populations.

Conclusion: This alternative would likely result in the same impacts as described in section IV.A.2.b. (proposal). Delay of the sale would permit ongoing and future studies to fill data gaps in the occurrence and distribution of fish species in the Shelikof Strait area. Therefore, potential impacts could be better understood and oilspill contingency plans could include specific information on fish habitats and populations.

Cumulative Effects: Delay of sale would likely have the same cumulative effects as described in the proposal.

Unavoidable Adverse Effects: Delay of sale would likely result in the same unavoidable adverse effects as described in section IV.A.2.

c. Impacts on Commercial Fishing: The impacts, cumulative effects, and unavoidable adverse effects on commercial fishing would not significantly differ from those of the proposal. Impacts are delayed, not avoided. Refer to section IV.A.2.c.

Conclusion: The impacts of this alternative would be the same as those of the proposal (sec. IV.A.2.c.).

Cumulative Effects: The cumulative effects of this alternative would be the same as those of the proposed action (sec. IV.A.2.c.).

Unavoidable Adverse Effects: The unavoidable adverse effects of this alternative would be the same as those of the proposal (sec. IV.A.2.c.).

d. Impacts on Marine and Coastal Birds: Delay of sale would have the same potential adverse impacts as the proposal (sec. IV.2.d.). However, delaying the sale could provide an opportunity to fill important data gaps in the occurence, distribution, and relative importance of the Shelikof Strait area for marine and coastal birds.

Conclusion: Delay of sale would have the same potential for adverse impacts as the proposal (sec. IV.A.2.d.).

Cumulative Effects: Delay of sale would have the same cumulative effects as described for the proposal (sec. IV.A.2.d.).

Unavoidable Adverse Effects: Unavoidable adverse effects would be the same as those of the proposed action (sec. IV.A.2.d.).

e. Impacts on Marine Mammals: Effects associated with this alternative would be essentially the same, at least qualitatively, as those discussed under the proposal (alternative I). The magnitude of effects could vary depending on the population status of affected species at the time when such a delay would terminate or when undesirable perturbations would occur.

f. Impacts on Endangered Species and Non-Endangered Cetaceans: Effects associated with this alternative would be essentially the same, at least qualitatively, as those discussed for the proposal (sec. IV.a.2.f.). Magnitude of effects could vary depending on population status of affected species at the time such a delay would terminate, or when undesirable perturbations would occur.

g. Impacts on Terrestrial Mammals: With this alternative, potential impacts would be the same as those previously described under the proposal (sec. IV.A.2.g.). This alternative would only postpone potential impact on terrestrial mammals to some future time.

Conclusion: With this alternative, the same impacts as described for the proposal would likely occur, but would be postponed.

Cumulative Effects: The additive effect of the proposal and other activities in the proposed lease area, would be the same with this alternative.

Unavoidable Adverse Effects: The unavoidable adverse effects on terrestrial mammals with this alternative would be the same as those described for the proposal, but would occur at some time in the future.

h. Impacts on Social Factors:

(1) Impacts on Population: This alternative would provide 2 additional years of lead time for preparation for an eventual sale and its associated population increases. On the other hand, the uncertainty surrounding a delay could inhibit successful attempts at obtaining financing for expansion of community infrastructure in the event of a major oil discovery. Given these uncertainties and the recent planning work already completed by Kodiak Island Borough, the community of Port Lions, the Kenai Peninsula Borough, and the community of Homer.

Conclusion: Population impacts would be delayed approximately 2 years.

Cumulative Effects: This alternative would only delay by 2 years the onset of population increases associated with this sale. Base case projections, which assume cumulative population, would not be changed (see tables IV.A.2.h.(1)-1 and -3).

Unavoidable Adverse Effects: There would be no unavoidable adverse effects for Kodiak and Port Lions. Homer and Kenai-Soldotna effects would be the same as for the proposal. See section IV.A.2.h.(1).

(2) Impacts on Sociocultural Systems: Delaying the sale would merely delay for 2 years the onset of impacts likely to occur, as discussed in section IV.A.h.(1), alternative I. See sections IV.A.3.h.(1) and IV.A.3.h.(4) for further discussion of potential impacts of this alternative on population and subsistence.

Conclusion: This alternative would result in impacts on the sociocultural systems of lower Cook Inlet and Shelikof Strait communities similar to those described in section IV.A.2.h.(1).

Cumulative Effects: Cumulative effects would be essentially the same as for the proposal, only delayed 2 years. See section IV.A.2.h.(2).

Unavoidable Adverse Effects: Unavoidable adverse effects would be the same as for the proposal, only delayed 2 years. See section IV.A.2.h.(2).

(3) Impacts on Community Infrastructure - Impacts on the Kenai, Homer, Kodiak, and Port Lions Areas: Delaying the proposed sale 2 years would merely delay the impacts cited in section IV.A.2.h.(2) (proposal) 2 years. In the case of Port Lions, a 2-year delay would provide additional time to plan and prepare for the community infrastructure impacts described in section IV.A.2.h.(3). This presumably might lessen some impact on readiness to meet increased police needs, etc.

Conclusion: A 2-year delay of the proposed sale would provide Port Lions an additional 2 years to plan and prepare for potential community infrastructure impacts associated with the proposed lease sale. There would be no impacts to the Kenai, Homer, and Kodiak areas with this alternative.

Cumulative Effects: Cumulative impacts would remain as described in section IV.A.2.h.(3).

Unavoidable Adverse Effects: Unavoidable adverse impacts remain as described in section IV.A.2.h.(3).

(4) Impacts on Subsistence: The impacts which occur with this alternative would be essentially the same as those described for the proposal (sec. IV.A.2.h.(4)).

Cumulative Effects: The cumulative effects of a 2-year delay in the proposed sale would be the same as those discussed under the proposal (sec. IV.A.2.h.(4)).

Unavoidable Adverse Effects: This alternative could postpone the unavoidably adverse effect of a statistically likely major oilspill event in Shelikof Strait and its likely disruption of subsistence activities and village economies. See the discussion for section IV.A.2.h.(4) (proposal) for the implications of these effects.

i. Impacts on the State, Regional, and Local Economies: Delaying the sale 2 years would merely delay the impacts cited in the proposal 2 years. From a local economic point of view there is no obvious advantage to delaying the sale 2 years.

Conclusion: See proposal, section IV.A.2.i.

Cumulative Effects: See proposal, section IV.A.2.i.

Unavoidable Adverse Effects: See proposal, section IV.A.2.i.

j. Impacts on Cultural Resources: A delay in the proposed lease sale would postpone impacts on terrestrial archeological and historic sites (identified in section IV.A.2.j.).

Conclusion: See proposal (sec. IV.A.2.j.).

Cumulative Effects: See proposal (sec. IV.A.2.j.).

Unavoidable Adverse Effects: There would be no unavoidable adverse effects with this alternative.

k. Impacts on Visual, Wilderness, and Recreation Resources: Impacts would be the same as those described in section IV.A.2.k. (proposal).

Conclusion: Refer to section IV.A.2.k. (proposal).

Cumulative Effects: Impacts of visual, wilderness, and recreation resources would be the same as those described for the proposal (sec. IV.A.2.k.).

Unavoidable Adverse Effects: Refer to the proposal (sec. IV.A.2.k.).

l. Impacts on Land Status and Land Use:

Conclusion: With this alternative, impacts on land status and land use would be the same as as those described for the proposal (sec. IV.A.2.l).

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

m. Impacts on Transportation Systems: Impacts on the transportation system of Port Lions would be the same with this alternative as with the proposal (sec. IV.A.2.m.). Impacts on the transportation systems of Anchorage and the Kenai Peninsula could actually be reduced due to probable improvements of their transport systems.

Conclusion: This alternative would not change many impacts on Port Lions but might reduce effects felt by other areas affected by the sale.

Cumulative Effects: Unknown, as a delay of sale would place it in a time frame for which we have little knowledge in regard to proposed projects.

Unavoidable Adverse Effects: Same as section IV.A.2.m.

n. Impacts on the Alaska Coastal Management Program:

Federal Coastal Zone Management Act: The Federal Coastal Zone Management Act of 1972, as amended, contains significant provisions affecting the development of OCS oil and gas resources. Section 307 of the CZMA provides that Federal agencies conducting or supporting activities directly affecting the coastal zone will do so consistent to the maximum extent practical with approved State coastal management programs. This section applies to Federal agency activities, Federal licenses and permits, OCS plans, and to projects funded by Federal agencies, and is discussed in Section I.C.

Alaska Coastal Management Program: The Alaska Coastal Management Program and the progress of local program development by the Kenai Peninsula and Kodiak Island Boroughs are outlined in Section III.D.

A prerequisite of approval of the ACMP by the Department of Commerce is that the national interest has been recognized in Alaska's coastal zone by considering uses and facilities that are of national significance (16 U.S.C. 1456(c)(8); 15 CFR 923.52). The ACMP requires that land and water uses of state concern cannot be unreasonably or arbitrarily restricted or excluded from the coastal zone by District CZM programs (AS 46.40.060). Included in this definition are resources and facilities that contribute to meeting national energy needs, including OCS exploration development activities and facilities.

Federal actions including OCS pre-lease activities, which would "directly affect" the coastal zone, have to be consistent to the maximum extent practicable with the approved ACMP. The Federal consistency regulations (15 CFR Part 930) also require that exploration, development, and production activities associated with offshore energy production which require a Federal license or permit be consistent if they affect any land use or water use in the coastal zone. Since the ACMP is broad, comprehensive, and process-oriented with land use specifics not identified, and since the specific effects on the coastal zone of subsequent lease activities are undetermined, the exact relationship or degree of impact or potential conflicts between the two processes cannot be determined at this time.

Kenai Peninsula Borough Coastal Management Program: The Kenai Peninsula Borough Coastal Management Program is described in Section III.D.3. The borough is presently involved in developing a district program and should have a plan completed by the fall of 1982. The borough expects to have its plan authorized by the State legislature in January 1982. This would occur after the proposed sale date of September 1981.

The KPB has considerable experience with oil and gas development as a result of several years of drilling on State waters in upper Cook Inlet and of lower Cook Inlet lease sale CI. As a result of sale CI, the KPB did a study of the implications of OCS development for the borough. It is assumed that the same types of onshore sites and development activities will occur as a result of sale 60. Much of the infrastructure is already in place and a considerable amount of the KPB economy depends on oil and gas and supporting activities.

Kodiak Island Borough Coastal Management Program: The Kodiak Island Borough (KIB) Coastal Management Program is described in section III.D.4. The borough is just beginning the development of its program. The KIB program will include that portion of the Kodiak Archipelago facing Shelikof Strait.

The KIB has sponsored studies pertinent to coastal management. However, these studies have focused on the east side of the Archipelago in response to proposed OCS sale 46 in the western Gulf of Alaska (Kramer, Chin, and Mayo, 1978). A 1978 study for the borough stated, as an OCS development goal, that development of OCS-related facilities would be discouraged in or around the population centers on Kodiak Island, and that if OCS facilities are located on the island that they be remote, self-sustained, and in limited number.

The KIB CZM program will include studies done in the past for the borough, plus some updating to include the new scenarios for sales 60 and 61. The program will probably not be legislatively authorized before the proposed sale 60 sale date.

Options for Decision: The ACMP, and the Kenai Peninsula and Kodiak Island Boroughs' Coastal Management Programs represent a planning process and proposed coastal land and water use plans, respectively, that designate uses and activities that are considered proper and improper for various identified portions of the lower Cook Inlet/Shelikof Strait areas. The Alaska Coastal Management Program (ACMP) has been approved by the Department of Commerce (DOC). The borough programs are currently being developed and remain to be adopted by the State and be officially recognized under the Federal CZMA.

A prerequisite of approval of the ACMP by the DOC is that the national interest be adequately considered in the development of the program. In Alaska's coastal zone, uses and facilities that are of national significance are considered in the definition of "uses of State concern." Uses of State concern cannot be unreasonably or arbitrarily restricted or excluded. Included in this definition are resources and facilities that contributre to meeting national energy needs.

The Federal Coastal Zone Management Act and implementing regulations provide that all Federal lease and permit activities described in detail in OCS plans and which affect any land use or water use in the coastal zone must be conducted in a manner consistent with approved CZM programs. Post-lease activi-

ties can be expected to affect Alaska's coastal zone, and may be influenced by the two boroughs' district programs.

When the borough programs (which may designate certain uses and activities) are approved, they would become part of the ACMP and complement the basic ACMP regulations, procedures, and philosophies. The State cannot approve a district program which is not in basic conformance with the State program policies in that program. One of the criteria for approval is that the district program should not unreasonably or arbitrarily restrict or exclude uses of State concern, which include the use of resources and the siting of facilities for energy production in the coastal zone.

Since the specifics of the borough's program are not yet determined, it is not possible to project the specific degree of impact or conflict between such program and the activities which might result from this proposal. Post-leasing activities that require Federal licenses or permits will have to be consistent to be permitted if they affect any land use or water use in Alaska's coastal zone.

At the present time, the Secretary of Interior has the following options regarding the proposed coastal management program of the North Slope Borough:

Reschedule the sale after the boroughs' CMPs have been approved and formally incorporated into the ACMP.

Cancel the sale: The orderly and efficient development of the area and efficient use of existing infrastructure would be restrained. Adoption of this option would also result in the same losses described in earlier sections with regard to cancelling the sale.

Proceed with the sale as planned. The mitigating measures and restrictions placed on post-sale operation should adequately protect the environment and should not adversely affect either the planning process or implementation of the boroughs' CMPs.

There undoubtedly will be more impact on developing the lower Cook Inlet oil and gas resources from the ACMP than vice versa, depending on the interpretation of how consistency will apply. This is because the ACMP is a comprehensive coastal land and water use program that provides for consideration of and decisionmaking about, among other things, energy production and development. The ACMP recognizes that mineral extraction has to occur where the resource is found, but it will influence the exploration, development and production activities, and facilities which might result from this proposal.

Proceed with the sale but delete tracts on which lessee activities might conflict with provisions of the ACMP.

In summary, there could be substantial impact on development of lower Cook Inlet oil and gas resources from the CMPs of the Kodiak Island and Kenai Peninsula Boroughs, because these plans could influence the exploration, development and production activities, and facilities. However, any onshore facilities which support exploration resulting from this proposal would likely be sited within the existing infrastructure. Given the long lead time involved, it can be assumed that the boroughs' plans would be in effect long before the

activities, facilities, and locations it would influence were identified, let alone developed. Delaying the lease sale until approval of the CMPs would provide little marginal benefit since the award of leases poses no immediate direct impact, and most post-lease activities are far enough in the future to come under the boroughs' CMPs.

o. Impacts on Water Quality:

Conclusion: Under this alternative, the impacts on water quality would be substantially the same as with the proposal (sec. IV.A.2.o.).

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

p. Impacts on Air Quality: Under this alternative, impacts on air quality would be the same as with the proposal (sec. IV.A.2.p.).

Conclusion: Impacts on air quality would be similar to those described for the proposal (sec. IV.A.2.p.).

Cumulative Effects: Future development actions would add to projected emissions inventory in the Cook Inlet area, and thus add to potentially cumulative air quality effects (see sec. IV.A.2.p.).

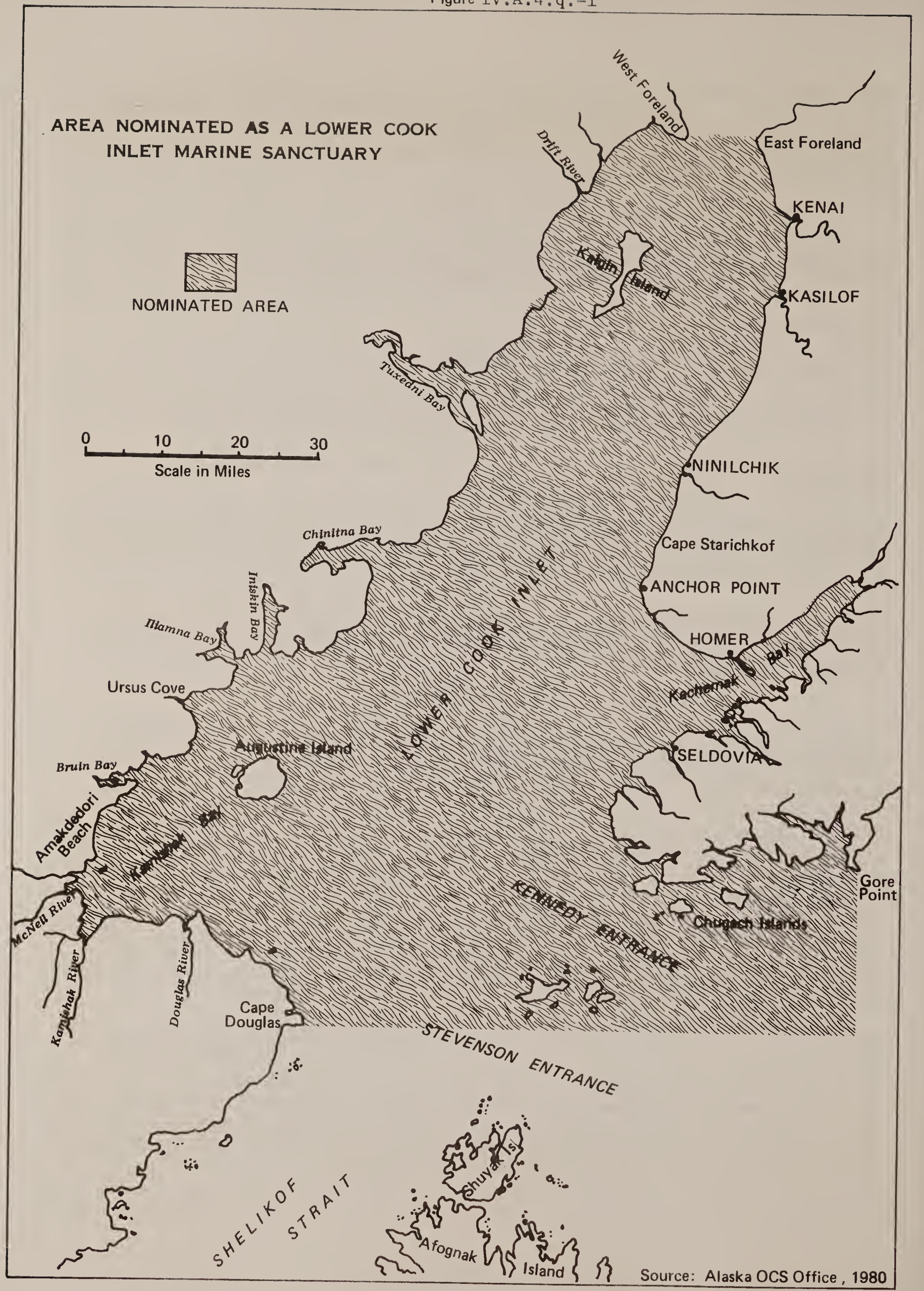
Unavoidable Adverse Effects: The unavoidable adverse effects which would occur as a result of this alternative would be the same as outlined for the proposal (sec. IV.A.2.p.).

q. Impacts on Marine Sanctuaries:

Proposals and Present Status: A 2-year delay of the proposed action would provide an opportunity for formal nomination of portions of the sale area for a marine sanctuary. Formal nomination for marine sanctuaries of various sizes, including one for all of lower Cook Inlet, have been submitted to the National Oceanic and Atmospheric Administration (NOAA). The other specific areas recommended are Kachemak Bay, Tuxedni Bay, the Barren Islands, and the Gulf coast of the Alaska Peninsula, including Kodiak Islands (fig. IV.A.4.q.-1). All of these areas are part of, or close to, the proposed lower Cook Inlet/ Shelikof Strait lease sale area. In response to these nominations, NOAA included them on its List of Recommended Areas (LRA) published in the Federal Register October 31, 1979. The nominations came in reponse to lease sales scheduled in Cook Inlet and the western Gulf of Alaska, but it is not known if the nominations were intended to preclude oil and gas leasing.

NOAA has not developed a schedule for the consideration of any of these sanctuary proposals, and it is unlikely that a formal public workshop will be conducted before publication of this document. In commenting on this proposed sale, NOAA recommended that the lease sale and any subsequent exploratory and development activities be conducted in a manner that ensures maximum protection of living marine resources and habitats. NOAA has no plans to do further work on any Alaskan sanctuary proposals during 1980.

Figure IV.A.4.q.-1



Source: Alaska OCS Office , 1980

The purposes of these nominations were for habitat preservation, species preservation, and research. All these areas contain large and important seabird colonies, and are extensively used by marine mammals. They are also characterized by rich finfish and shellfish fisheries which are tremendously important to both recreational and commercial fishermen. Kelp and eelgrass are found in these areas extensively. Descriptions of and impacts to the natural resources of the area are found in sections III.B. and IV.A.2., respectively.

There are now 70 areas on NOAA's List of Recommended Areas, including lower Cook Inlet, but only seven areas are on the List of Active Candidates. Lower Cook Inlet is not one of these active candidates. In March 1980, a management plan for the Key Largo Coral Reef Marine Sanctuary in the Gulf of Mexico was established after 5 years in development. Presently, this is the only marine sanctuary established to protect a living resource. In addition, in Volume 44 of the Federal Register, October 31, 1979, NOAA announced the removal of all of the Georges Bank area, including the OCS oil and gas lease sale 42 area from the List of Active Candidates, because safeguards had been jointly developed with Interior to address environmental risks to the Georges Bank.

The OCSLA imposes on the Secretary of the Interior the duty to balance the benefits of expedited development of oil and gas resources with the other goals of the Act, including the need to protect the human, coastal, and marine environment. In many cases, the OCSLA, as well as other legislation, provides equity considerations when interference occurs with resources which are the subject of other Federal programs. At the present time, the Secretary of Interior retains a number of options for decision regarding the marine sanctuary proposal. They are:

Delay the sale until a decision has been made regarding the marine sanctuary issues. Adoption of this option would retain some of the area in an oil-development free state for future marine sanctuary consideration, but would not entirely remove the risk of potential impacts from oil and gas activities, since oil and gas related development of OCS sale CI in areas offshore the 3-mile limit will continue during the delay period. Orderly and efficient development of oil and/or gas structures found near the Federal/State boundaries may require future sales in Federal waters. This could make the delay decision untenable.

Cancel the sale. Adoption of this option would have the same results as described above. In addition, the orderly and efficient development of the area and efficient use of the existing infrastructure would be restrained.

Proceed with the sale as planned, pending a decision regarding the marine sanctuary proposal.

Under the OCSLA, the Secretary of Interior must balance the benefits of oil and gas development with the other goals of the act.

More specifically, the Secretary must address the probability and magnitude of the potential impacts associated with oil and gas development and, to the extent practical, reduce such impacts through mitigating measures. The OCSLA mirrors this in its goal of balancing the benefits of expedited oil and gas

development with protection of the marine, human, and coastal environment. Through the Secretary's mandate of balancing orderly resource development with environmental protection, as well as compliance with the Endangered Species Act and the Marine Mammal Protection Act and consistency provisions of the Coastal Zone Management Act, the exploration, development, and production of oil and gas should not preclude the possible future decision of creating a marine sanctuary in lower Cook Inlet. The marine sanctuary value of resources will not be unnecessarily jeopardized, because mitigating measures are adequate to protect them.

It is not presently known what configuration or regulatory controls would pertain to a DOC-proposed marine sanctuary. The actual areas involved could be significantly different from those suggested above. The policy, objective, and goals of such a sanctuary are also largely unknown because they have not been formulated.

Mitigating measures developed specifically for this lease area are expected to provide additional protection to the resources of the sale area. The OCSLA requires compliance with all other applicable laws such as the Marine Mammal Protection Act and the Endangered Species Act. It is not expected, therefore, that Marine Sanctuary restrictions would need to be more strict.

The result of this option is that adequate protection will be given to the area through the many authorities of the Secretary of Interior and that the orderly and efficient development of the area may also be pursued without significant harm to the natural resources of the area and the environment.

In the short term, because of the adequacy of controls in place or proposed for this action, little if anything should happen to affect Marine Sanctuary management options. In the long-term, oil and gas development under this proposed lease sale should not constrain future decisions concerning the creation of a sanctuary adjacent to or in the sale area.

5. Alternative IV (68 blocks): Modify the proposal by deletion of 66 blocks in Shelikof Strait and 19 blocks in Cook Inlet. The following sections assess the impacts of oil and gas leasing for alternative IV (see fig. II.B.4.a.-1).

a. Impacts on Vulnerable Coastal Habitats: Impacts on coastal habitats (sec. IV.A.2.a.) would be altered by deletion of tracts in Shelikof Strait. The most likely number of major oilspills equals only one, as opposed to four for the proposal (table 1, appendix D). The most likely number oilspills from other sources (existing leases in lower Cook Inlet and the existing tanker routes from upper Cook Inlet) equals seven, so the overall risks of major oilspills are reduced only about 25 percent by deletion of Shelikof Strait (from 11 with the proposal to 8 with this alternative).

The coastal area of greatest risk from oilspills is changed greatly by alternative IV; Shelikof Strait would be impacted less frequently. For example, the probability of impact on the razor clam beaches near Swikshak in northwestern Shelikof Strait is reduced about 85 percent by alternative IV. The clams on these beaches are worth up to $100,000 per year, and are vulnerable to oilspills. As discussed in section IV.A.2.a., clams on beaches which are impacted by an oilspill would probably be killed or tainted for a period of one year.

Similarly, the probability of oilspill impacts on the western Kodiak Island bays, such as Kupreanof Strait, is reduced about 85 percent by alternative IV. Kupreanof Strait and the adjacent bays are important for reproduction of very valuable herring and salmon populations, as explained in section III.B.2.

The probability of oilspills impacting the coastal habitat in lower Cook Inlet remains essentially the same in spite of the deletion of any blocks in Shelikof Strait.

Aside from oilspills, the potential impacts of alternative IV on the coastal habitats would not be severe (sec. IV.A.2.a.).

Conclusion: Alternative IV reduces by about 25 percent the probability of oilspill occurence. The probability of an oilspill impacting vulnerable coastal habitats in Shelikof Strait is reduced by about 85 percent with this alternative.

Cumulative Effects: A large number of potential oilspills are associated with existing leases and tanker routes in lower Cook Inlet. Because of these existing risks, deletion of Shelikof Strait tracts from the proposed sale would reduce the projected cumulative impacts on the Shelikof Strait coastal habitats. The cumulative impacts on lower Cook Inlet coastal habitats would remain unchanged from those associated with the proposal (sec. IV.A.2.a.).

Unavoidable Adverse Effects: The oilspills that may impact the vulnerable coastal habitat are not easily avoidable. They would be due to unpredictable accidents, and could not be entirely cleaned up before impacting some coastal habitats. Potential mitigating measure number 2 (sec. II.B.1.b.) could help reduçe the possibility of an oilspill occurring and reduce the potential for damage to the surrounding coastal habitats. Further, the Offshore Oil Pollution Compensation Fund has been established to pay for the costs of OCS oilspill impacts (see appendix F).

b. Impacts on Commercial and Sportfish: Deletion of the Shelikof Strait blocks from the proposal would significantly reduce the risks of potential oil pollution impacts on pink salmon; king, tanner, and Dungeness crab; and bottomfish species in Shelikof Strait. However, oilspill risk to lower Cook Inlet fish habitats would remain about the same as with the proposal. Oilspill probability risks to fish habitats along both sides of Shelikof Strait would be reduced. In land segment 45, Kukak Bay-Kinak Bay (an important shrimp area) oilspill probability risk decreases from 31 percent (the proposal) to 8 percent with this alternative (appendix D, tables 14-15, no. 45). However, oilspill risk to coastal spawning habitats in lower Cook Inlet remain about the same.

Changes in the transportation scenario (eliminating a pipeline through Kupreanof Strait, a tanker terminal near Whale Pass, and tankering out of Marmot Bay), would greatly reduce oilspill risks to the Whale Pass area, near the important habitats mentioned above.

Conclusion: Deletion of the Shelikof Strait blocks could significantly reduce the potential impacts of oil pollution on fin and shellfish populations in the Shelikof Strait. However, impacts to fish populations in the lower Cook Inlet region would be essentially the same as in the proposal.

Cumulative Effects: The potential cumulative oilspill effects of this alternative and of existing oil and gas activities in Cook Inlet on fin and shellfish populations in the Shelikof Strait area would be greatly reduced by this alternative.

Unavoidable Adverse Effects: The unavoidable adverse effects would be similar to those described for Cook Inlet in section IV.A.2.b. (proposal). However, unavoidable adverse impacts would be significantly reduced for the Shelikof Strait.

c. Impacts on Commercial Fishing: Deletion of the Shelikof Strait blocks and those at the extreme north end of the proposed sale area would reduce impacts (discussed in section III.A.2.c.) primarily in the Shelikof Strait area. This alternative would reduce the conflicts for dock space, materials, and labor in the western Kodiak area. It would reduce the chance of a pollutant event fouling fishing gear and commercial fish species. It would also reduce the threat of fish population loss (sec. III.A.2.b.). Based on the oilspill trajectory model, the area having the greatest chance of being affected by a pollutant event (Uganik and Malina Bays) would be almost totally protected.

Conclusion: This alternative would reduce potential impacts on commercial fishing in the sale area.

Cumulative Effects: Cumulative impacts in the Shelikof Strait area would be reduced by this alternative. There may be some residual ocean space use conflicts because many of the fishermen range between Shelikof Strait and Cook Inlet, but immediate impacts on commercial fishing in Shelikof Strait would be reduced. Cumulative impacts in the Cook Inlet area would be the same as discussed in section IV.A.2.c.

Unavoidable Adverse Effects: There may be some ocean space conflicts between fishing vessels and support and supply vessels in Shelikof Strait. In Cook Inlet, these impacts would be the same as the proposal (sec. IV.A.2.c.).

d. Impacts on Marine and Coastal Birds: Deletion of the Shelikof Strait blocks from the proposal would reduce significantly the risks of potential oil pollution impacts on marine birds in offshore foraging areas and coastal habitats in Shelikof Strait, Whale Pass, Kupreanof Strait, and Marmot Bay. Oilspill probability contact for seabird foraging areas within 3 daybs (appendix D, table 8-9) decrease from 49 percent with the proposal to 5 percent during the spring-summer, and from 57 percent to 13 percent during the fall-winter. However, oilspill risks to lower Cook Inlet foraging areas remain about the same as the proposal. Oilspill probability risks to coastal habitats along both sides of Shelikof Strait are drastically reduced. For example the Raspberry Island-Kupreanof Strait area oilspill probability contact decreases from 23 percent (the proposal) to 3 percent with this alternative (appendix D, table 14-15, no. 15). Land segment 45, Kukak Bay-Kinak Bay oilspill probability risk decreases from 31 percent to 8 percent (the proposal) with this alternative (appendix D, table 14-15, no. 45). However, oilspill risk to coastal habitats in lower Cook Inlet and the Barren Islands remain about the same.

Changes in the transportation scenario (eliminating a pipeline through Kupreanof Strait, a tanker terminal near Whale Pass, and tankering out of Marmot Bay) would greatly reduce oilspill risks to the Whale Pass area, one of the most important marine bird concentration areas in the Kodiak and lower Cook Inlet region. The oilspill trajectory analysis does not include the oilspill probability risks to inner Marmot Bay and Whale Pass.

Conclusion: Deletion of the Shelikof Strait blocks could significantly reduce the potential impacts of oil pollution on marine bird populations in the Kodiak and Shelikof Strait areas. However, bird populations in the lower Cook Inlet region and the Barren Islands will be subject to the same potential impacts as in the proposal.

Cumulative Effects: The combined potential oilspill effects of this alternative and of existing petroleum activities in Cook Inlet on marine bird populations in the Shelikof Strait-Kodiak area could be significantly reduced as indicated by comparing the oilspill trajectory analysis results (appendix D, tables 8-16) between this alternative and the proposal. For example, the cumulative oilspill probability on southern seabird foraging areas are reduced from 66 percent to 34 percent during the spring-summer period (appendix D, tables 8 and 4). However, cumulative oilspill probability risks for foraging areas in the lower Cook Inlet and Barren Islands are about the same as the proposal (high oilspill risk from existing tankering 63-68% and existing lease activities 76-77%, appendix D, tables 14 and 21). The cumulative effects along the Shelikof Strait could be significantly reduced by this proposal. For example, Raspberry Island-Kupreanof Strait (land segment 15) cumulative oilspill probability of contact is reduced from 30 percent to 12 percent when comparing the proposal with this alternative (for the 10 day spill trajectory). However, lower Cook Inlet coastal areas such as Kamishak Bay and the Barren Islands cumulative oilspill probabilities are about the same between this alternative and the proposal; these areas are at high risk from existing hydrocarbon activities (see appendix D, tables 14 and 15, nos. 53, 54, and 56).

In conclusion, cumulative impacts from oil pollution on marine birds could be greatly reduced for the Shelikof-Kodiak area by this alternative. However, lower Cook Inlet and the Barren Islands bird populations and habitats would fare the same risk from oil impacts and other development projects as with the proposal.

Unavoidable Adverse Effects: Deletion of the Shelikof Strait blocks would significantly reduce the unavoidable impacts of hydrocarbon development described in the proposal on bird populations within the Shelikof Strait area. However, bird populations on the Barren Islands and Cook Inlet would probably be exposed to the same unavoidable impacts described in the proposal.

e. Impacts on Marine Mammals: Refer to section IV.A.2.e. for a discussion of the qualitative nature of direct and indirect effects on marine mammals that may be associated with the proposal or its alternatives. Appendix D, table 9, shows that with this alternative the Barren Islands (area C, including Sugarloaf Island) would be subjected to slightly less oilspill risk than would be expected under the proposal (10% chance, alternative IV versus 11% chance, alternative I), of spill contact over the life of the field. (Note: Unless otherwise specified, oilspill risk analyses made in

this section refer to probabilities conditional on the development of a production field and to spill contact rates within 10 days of simulated launch.) As for the proposal, the Ushagat Island vicinity (with three sea lion hauling areas, graphic 11), is under a 6 percent chance of spill contact (appendix D, table 15, no. 81), Sugarloaf Island shorelines are under a 2 percent chance of spill contact (appendix D, table 15, no. 82), and Marmot Island faces practically no risk (appendix D, table 15, no. 22). Thus, for the major sea lion concentration areas, Alternative IV does little to afford additional protection from the direct effects of spills as compared to the proposal. However, considerable protection of sea lion hauling areas receiving intermittent use at Cape Gull and a consistently used area at Takli Island Rock, on the western side of Shelikof Strait would be slightly affected. Under alternative IV, Cape Gull would be subjected to an 8 percent chance of oilspill contact (appendix D, table 15, no. 45) as compared to 31 percent under the proposal. Takli Island Rock, which is used by 700-1,000 sea lions, would face a 2 percent chance of spill contact (appendix D, table 15, no. 44) as compared to 8 percent with the proposal. Probability of spills hitting the Puale Bay area would be reduced from 5 percent (alternative I) to 1 percent (appendix D, table 15, no. 41).

Alternative IV would provide substantial reduction of risk of oilspill contact to harbor seal habitats of the northern and northwestern Kodiak Archipelago. The Malina Bay hauling area would face a 3 percent chance of contact (appendix D, table 15, no. 15) with this alternative as compared to a 23 percent chance with the proposal. The northern Afognak and western Shuyak Island hauling areas (graphic 11) would be subjected to only a 6 percent chance of contact (appendix D, table 15, no. 17) as compared to a 15 percent chance under the proposal.

Overall, nearshore marine environments of the northern and northwestern Kodiak Archipelago would also be exposed to less risks. (Appendix D, table 9, shows area D having a 17% chance of contact under Alternative IV as compared to 48% under alternative I.) Such reduction could be important to long-term harbor seal productivity in the area. The Tugidak Island harbor seal hauling and pupping concentration area would remain under low risk of oilspills with this alternative. Probability of spill contact with St. Augustine Island, a harbor seal pupping area, would only be reduced 2 percent (from 9% with alternative I, see appendix D, table 15, no. 56), and the nearshore areas of Kamishak Bay in the immediate vicinity of Augustine Island would remain under high (29%) risk (appendix D, table 9, area H).

This alternative would probably reduce risk to fur seals in Shelikof Strait. However, no substantial reduction of risk to the bulk of the fur seal population migrating east of Kodiak would be afforded as compared to the probable low risks already described for the proposal.

Alternative IV would substantially reduce risks of oilspill contact to sea otter habitats of the northern and northwestern Kodiak Archipelago and western Shelikof Strait areas (appendix D, table 9, areas D and E). As discussed for harbor seals, considerable reduction of risks would occur in the former regions (17% with alternative IV versus 48% percent with alternative I; appendix D, tables 9 and 8, respectively, area D). Other areas adjacent to lower Cook Inlet, such as the southwestern Kenai Peninsula, Anchor Point, and Kamishak Bay (appendix D, table 9, areas A, G, H), only show slight reduction of risk

of oilspill contact as a result of this alternative. In Kamishak Bay, sea otters and their habitat would face the same high oilspill risk and with this alternative as with the proposal (appendix D, table 9, area D).

Thus, when compared to the proposal, alternative IV would reduce localized indirect effects on marine mammals inhabiting Shelikof Strait, especially sea otters which rely on sedentary benthic food sources. Since sea lions, harbor seals, and fur seals rely primarily on food sources which are not sedentary, it is not possible to accurately predict how selection of alternative IV may or may not indirectly affect such species. Nevertheless, since the areas showing the greatest reduction of oilspill risk are noted for the greater abundance of sea otters (e.g., Afognak-Shuyak Island habitats), this alternative (or alternative V, see section VI.A.6.e.) could be considered of major importance in terms of minimizing risks to sea otter populations of the sale 60 area. Less oilspill-induced mortality and/or higher carrying capacity (over the long-term) of the latter sea otter habitats would be expected under this alternative than would be expected under the proposal.

Effects of noise and disturbance may be felt by sea lion or harbor seal populations in particular (sec. IV.A.2.e.). Alternative IV would probably reduce the potential for disturbance of harbor seal and sea lion hauling areas of the Shelikof Strait region. However, potential for disturbance of sea lions in the Barren Islands would probably remain at levels which may exist for the proposal. Since alternative IV would not involve the construction of a pipeline to, and tanker terminal on, eastern Kodiak Island, localized effects of disturbance would probably be reduced in Kupreanof Strait and eastern Kodiak Island (such as near Talnik Point) as compared to the proposal. Nevertheless, it is possible, if not likely, that noise disturbance associated with exploration, development, and production phases will directly impact sea lions and/or harbor seals in the sale area as described for the proposal, although perhaps to a reduced level in the Shelikof Strait region.

Conclusion: It can be concluded that alternative IV would afford substantial reduction of risk of oilspills and related effects to major sea otter and certain harbor seal habitats, particularly those in the northern Kodiak Archipelago and Shelikof Strait as compared to the proposal. Protection of sea lion hauling and feeding areas in Shelikof Strait would also be enhanced. Oilspill-related effects in lower Cook Inlet would remain at relatively the same level as under the proposal, although reduced somewhat in terms of spill contact probabilities. An uncertain, but probably minimal reduction of risk to fur seals would be accrued. Reduced localized impacts of spills on eastern Kodiak Island marine habitats would be expected since no tanker facilities would be constructed in the vicinity.

Cumulative Effects: Appendix D, table 9, shows that the cumulative probability (alternative IV plus existing lease area) oilspill contact with marine mammal habitats of the eastern Kenai Peninsula, the Barren Islands, and the north-northwestern Kodiak Archipelago would be high (areas B, C, and D, respectively). Cumulative contact on the north-northwestern Kodiak Archipelago would be reduced by this alternative from 68 percent (alternative I) to 48 percent chance (alternative IV). Cumulative oil contact probabilities of marine mammal habitats in the vicinity of Anchor Point, the southwestern Kenai Peninsula, Kamishak Bay, and western Shelikof Strait would be moderate to high (appendix D, table 9, areas G, A, H, and E, respectively). Cumulative oilspill

contact with Sugarloaf Island would be the same for this alternative as for the proposal (11% chance, appendix D, table 15, No. 2). Land segments in the vicinity of Cape Ugat and Cape Uganik would have less probability of cumulative spills (14% with alternative IV versus 23%, alternative I) than under the proposal (appendix D, table 15, no. 13). In western Shelikof Strait, substantial reduction of cumulative oilspill contact would result for Cape Gull (24% chance with alternative IV vs. 32% with alternative I), and limited reduction of risk for Takli Island Rock. Risk would also reduce slightly for Puale Bay. Areas mentioned here are known habitat of sea otters (eastern Kenai Peninsula, Barren Islands, northern Kodiak Archipelago, Anchor Point, southwestern Kenai Peninsula, Kamishak Bay, and western Shelikof Strait), sea lions (eastern Kenai Peninsula, Barren Islands, northern Kodiak Archipelago, Cape Ugat and Cape Uganik, Cape Gull, Takli Island Rock, and Puale Bay), and harbor seals (northern Kodiak Archipelago, Kamishak Bay, and Shelikof Strait coastal areas).

Of concern for this alternative, as well as the proposal, is the high probability of cumulative spills in the Barren Island area. Alternative IV reduced this probability by only 1 percent compared to the proposal (see appendix D, tables 8 and 9, area C), and for Sugarloaf Island, no reduction of risk would be afforded by this alternative (appendix D, table 15, no. 82). Insensitivity of cumulative spill probability in the area to changes in the proposal may be related to the moderate level of risk (18%) associated with existing tankering (appendix D, table 32, area C). Sea lions occupying Sugarloaf Island and surrounding waters may eventually show a response to chronic or cumulative spill occurrence under alternative IV, and the degree of this response would be on the same order as that sustained under alternative I (the proposal). The Portlock Bank feeding areas of sea lions and fur seals would be subjected to less oilspill risk associated with tanker traffic under this alternative. Indirect effects of repeated spills may also be sustained by harbor seals, but probably to a lesser extent in Shelikof Strait than would occur under the proposal. Therefore, this alternative would probably contribute less to cumulative effects of oilspills than would the proposal.

The extent of cumulative, disturbance-related mortality or behavioral change due to alternative IV on marine mammals is unknown. Elimination of a tanker loading facility on eastern Kodiak Island and reduction of activity in Shelikof Strait would probably reduce potential for such effects on sea lions and harbor seals. The contribution of alternative IV to nonspill-related cumulative effects on marine mammal populations (e.g., loss of habitat to facility sites) in the proposed sale area is unknown.

Unavoidable Adverse Effects: If the field goes into production, it is likely that sea otters will sustain some mortality as a direct result of spills associated with this alternative, although less than would be incurred by the proposal. It is likely that localized habitat deterioration and/or food source loss resulting from oilspills would occur at least temporarily, especially for sea otters or harbor seals in lower Cook Inlet. It is possible, if not likely, that unavoidable disturbance of sea lion or harbor seal concentrations would occur as a result of long-term changes in the transportation systems, localized impacts of facility construction, or localized aircraft, boat, or other industrial noise and activity.

Alternative IV would reduce cumulative direct negative effects on marine mammal populations of the northern Kodiak Archipelago (e.g., Afognak-Shuyak Island area) and Shelikof Strait, as compared to the proposal. Areas in the lower Cook Inlet region (Anchor Point, Kachemak Bay, and Kamishak Bay) would not experience substantial reduction of cumulative oilspill risk as a result of this alternative. Direct effects of cumulative spills on sea otters would be likely, and oilspill-induced indirect effects through reduced habitat quality and/or population productivity would also be likely. The magnitude of direct or indirect effects on sea otters (or other species) could be less than that sustained under the proposal assuming a correlation exists between spill contact probability and wildlife population responses since the cumulative probabilities for alternative IV were generally less in certain important habitats (e.g., north and northwestern Kodiak Archipelago) than those computed for the proposal. This alternative would reduce the potential for disturbance of sea lions and harbor seals in Shelikof Strait, as well as on eastern Kodiak Island, as compared to the proposal.

f. Impacts on Endangered Species and Non-Endangered Cetaceans: See section IV.A.2.f. for a general discussion of petroleum-related impacts on endangered species and non-endangered cetaceans. The oilspill risk analysis for alternative IV shows substantial reduction in probability of spill contact and potential spill effects for northern and northwest Kodiak Archipelago nearshore areas (appendix 7, table 9, area D) as compared to the proposal. Thus, a moderate (17%) chance of spills affecting areas used by endangered and non-endangered cetaceans in this locale would be sustained, compared to higher (48% chance) associated with the proposal. As for the proposal, nearshore areas on the eastern side of Kodiak Island would be subjected to little spill risk. This alternative provides little additional protection to the Barren Island area or the latter area as compared to the proposal, and therefore provides little additional protection to areas of high seasonal use by gray whales. The extent of movement of spills from lower Cook Inlet into the open water of the Gulf of Alaska and Portlock Bank areas would be about the same as estimated for the proposal since tracts for which Dames and Moore (1980; figs. 15-30) simulated spills would be leased.

Of importance is the apparent reduction of spill contact probability for nearshore environments of eastern Shelikof Strait (and other areas in Shelikof Strait) which would be afforded by this alternative. Land segments from Viekoda Bay to Uyak Bay (appendix D, table 15; nos. 12, 13, 14) show a substantial reduction on oilspill risk (1-4% chance) as a result of this alternative compared to higher (6-14%) risks for the proposal. Thus, for at least one area used by endangered species (fin and gray whales) oilspill vulnerability would be reduced. Habitats and local populations of other cetaceans which may occur in the strait would also be at less oilspill risk.

Alternative IV would do little to reduce oilspill risk to beluga whales (or their habitats) which may winter in Kamishak Bay. This alternative shows a 29 percent chance of spill contact with area H (appendix D, table 9), as compared to 33 percent chance for the proposal. Oilspill risk to nearshore environments north of Kamishak Bay and Kachemak Bay is low for this alternative (as well as for the proposal).

Elimination of the need for a tanker terminal in the Talnik Point vicinity with this alternative would also reduce probable localized impacts of spills, disturbance, or cetacean habitat changes which may occur under the proposal.

No negative effects would be expected to be sustained by Aleutian Canada geese as a result of this alternative.

Conclusion: It is possible that endangered and non-endangered cetaceans may sustain direct and indirect effects due to oilspill occurrence in areas of high risk of contact such as the northern Kodiak Archipelago and Kamishak Bay. Cumulative probabilities of spills are high in these areas. However, effects on whales would possibly be less than those of the proposal. This alternative would pose less oilspill risk or disturbance on cetaceans which may occur along the eastern side of Kodiak Island and Shelikof Strait than the proposal. It is possible that cetaceans may sustain negative effects as a result of disturbance, but probably to a lesser extent than would be incurred under the proposal. There is no evidence at this time to suggest any significant impacts of this alternative on endangered birds.

Cumulative Effects: Cumulative oilspill risks as a result of alternative IV plus the existing leases are relatively high for the northern and northwest Kodiak Archipelago, Barren Islands, and eastern Kenai Peninsula (appendix D, table 9, areas B (25%), C (38%), and D (48%)), and of medium risk for land segments in eastern Shelikof Strait (appendix D, table 15, nos. 12, 13, 14). Of the former areas, area D would receive the most protection from these cumulative direct oilspill impacts since the cumulative probability of spills is 20 percent less than would be incurred under the proposal. Cumulative spill probabilities for lower Cook Inlet (e.g. Kamishak Bay) are virtually unchanged (as compared to the proposal) as a result of this alternative, remaining very high (76% chance) in the Augustine Island-Cape Douglas vicinity (Appendix D, table 9, area H). Alternative IV would do little to reduce uncertain cumulative oilspill effects in terms of oilspill-related mortality or reduction of food sources in areas which may be important to endangered cetaceans. Alternative IV may reduce cumulative disturbance and/or indirect effects, particularly for species frequenting the eastern nearshore areas of Kodiak Island. Relatively little can be said about alternative IV in an absolute sense except that certain localized reduction of cumulative effects may occur, particularly in Shelikof Strait, Kupreanof Strait, and the Talnik Point-Marmot Bay area.

Cumulative effects on Aleutian Canada geese would not be expected to be significant as a result of this alternative.

Unavoidable Adverse Effects: The degree of unavoidable impacts on endangered and non-endangered whales as a result of this alternative is unknown. No unavoidable adverse impacts are expected to be sustained by Aleutian Canada geese as a result of this alternative.

g. Impacts on Terrestrial Mammals: Deletion of Shelikof Strait blocks would reduce the risk of oil pollution impacts on terrestrial mammals and their coastal habitats along the Kodiak Archipelago and the Alaska Peninsula side of Shelikof Strait. The oilspill analysis (sec. IV.A.1.d.) indicates significant reduction of spill risk for the southwest Afognak-Raspberry Islands coastal habitat which contains brown bear intensive stream use areas (see graphic 9 and fig. IV.A.1.d.-7, land segment 15). The probability of an oilspill contacting Afognak-Raspberry Islands is reduced from 23 percent with the proposal to 3 percent with this alternative (appendix D, tables 14 and 15, No. 15). The probability of an oilspill contacting brown

bear high spring-use and stream-use areas in Kukak Bay is reduced from 31 percent to 8 percent with this alternative (appendix D, tables 14 and 15, no. 45). However, brown bear spring-use areas and other terrestrial mammal coastal habitats in Kamishak Bay would face the same risk to oilspills as the proposal.

This alternative would eliminate the need for an onshore pipeline and tanker terminal facility at Talnik Point. Thus, there would be no onshore habitat disturbance in the Kodiak area with this alternative. However, terrestrial mammals and their habitat on the Kenai Peninsula between Anchor Point and Nikiski would still be affected.

Conclusion: Deletion of the Shelikof Strait blocks could reduce potential oil pollution impacts on terrestrial mammals and their habitats along Shelikof Strait and eliminate onshore habitat disturbance in the Talnik Point-Whale Passage area. However, effect on terrestrial mammals and their coastal habitats in the lower Cook Inlet area would be the same as the proposal (sec. IV.A.2.g.). The overall impacts on terrestrial mammals would likely be minor.

Cumulative Effects: This alternative could effectively reduce cumulative effects on terrestrial mammals in the Shelikof Strait area. In the lower Cook Inlet area, terrestrial mammals would be subject to the same degree of cumulative impacts as the proposal (sec. IV.A.2.g.).

Unavoidable Adverse Effects: Deletion of the Shelikof Strait blocks would eliminate most unavoidable disturbances of terrestrial mammal habitat and populations on Kodiak Island, but not in the lower Cook Inlet area where terrestrial mammals would be exposed to the same unavoidable impacts as with the proposal (sec. IV.A.2.g.).

h. Impacts on Social Factors:

(1) Impacts on Population: Deletion of the Shelikof Strait blocks would eliminate population impacts on Port Lions and Kodiak by eliminating the need for an oil terminal in the Kodiak-Port Lions area. Impacts in the Kenai-Soldotna and Homer areas would be the same as those described in section IV.A.2.h.(1) (see table IV.A.2.h.(1)-4).

Conclusion: Major population impacts on the Port Lions and Kodiak areas would be eliminated with this alternative. Homer and Kenai-Soldotna population impacts remain the same as for the proposal. See section IV.A.2.h.(1).

Cumulative Effects: Cumulative population increases with respect to this alternative would be most serious in Homer and would be the same as those outlined for the proposal (sec. IV.A.2.h.(1)). The cumulative effects for Port Lions and Kodiak would be reduced substantially with elimination of Shelikof Strait blocks and associated construction of terminal facilities in the Port Lions area.

Unavoidable Adverse Effects: These would be the same for Homer and Kenai-Soldotna as for the proposal. See section IV.A.2.h.(1). This alternative substantially reduces the unavoidable adverse effects on Port Lions and Kodiak resources and environment.

(2) Impacts on Sociocultural Systems: Sociocultural impacts on the communities of Kodiak and Port Lions would be minimized under this alternative. Easily absorbed impacts on Kenai and Soldotna would be insignificant. Homer would experience equivalent impacts as described for alternative I (sec. IV.A.2.h.(2)).

Conclusion: This alternative would significantly reduce potential major impacts on the sociocultural systems of Kodiak and Port Lions by reducing oilspill risk and potential disruption from construction of faciltieis in the Kodiak-Port Lions area and pipelines in the Talnik Point-Port Lions area. On the other hand, the positive effects to be gained by the community of Port Lions with alternative I would be eliminated by this alternative (see sec. IV.A.2.h.(2)).

Cumulative Effects: Cumulative sociocultural impacts on Kodiak and Port Lions would be reduced significantly. Homer and Kenai-Soldotna impacts would be the same as in the proposal.

Unavoidable Adverse Effects: By deleting blocks in Shelikof Strait, unavoidable adverse effects of potential oilspills, including heightened social conflict in Kodiak and Port Lions and temporary disruption of to smaller subsistence villages along Shelikof Strait, would be minimized.

(3) Impacts on Community Infrastructure - Impacts on the Kenai, Homer, Kodiak, and Port Lions Areas: The deletion of some lower Cook Inlet and all Shelikof Strait blocks confine potential impacts to the Kenai Peninsula area. Growth in this area is described in section III.H.2. Impacts on community infrastructure in the Kenai and Homer areas resulting from this alternative would be as described in section IV.A.2.h.(3).

Conclusion: Impacts resulting from this alternative would be limited to the Kenai and Homer areas and are described in section IV.A.2.h.(3).

Cumulative Effects: Cumulative impacts resulting from this alternative would be limited to the Kenai and Homer areas and are described in section IV.A.2.h.(3). There would be no cumulative impacts on the Kodiak and Port Lions areas.

Unavoidable Adverse Effects: See section IV.A.2.h.(3) for the Kenai and Homer areas only.

(4) Impacts on Subsistence: Deletion of Shelikof Strait blocks would substantially reduce the oilspill risk to all the primary subsistence-oriented villages along Shelikof Strait. Alternative IV would also reduce the risk to subsistence use areas near English Bay and Port Graham in Cook Inlet.

Conclusion: A major oilspill event could seriously disrupt the local economies of villages and cause hardship to residents dependent upon locally available resources. The extent of disruption and hardship would vary with the size of the spill and other factors. See the discussion under the proposal (sec. IV.A.2.h.(4)). This alternative reduces the high oilspill risks to Shelikof Strait villages and the resources on which they depend.

Cumulative Effects: The additional risk of continued exploration on sale CI leases added to the risk of oilspills from alternative IV is depicted in figure IV.A.1.d.-12. Three land segments in Kamishak Bay and one near Anchor Point, as well as land segment 81 on the Barren Islands, show high risk of oilspill contact when current CI lease exploration risks are added to the risks of this alternative. No additional risk to primary subsistence use areas occurs under this cumulative case, making it preferable to other alternatives.

Unavoidable Adverse Effects: With deletion of the Shelikof Strait blocks, the unavoidable adverse effects of oilspills on subsistence use areas in Shelikof Strait and Cook Inlet would be substantially moderated. See the discussion under the proposal (sec.IV.A.2.h.(4)).

i. Impacts on the State, Regional, and Local Economies: This alternative eliminates most impacts in the Kodiak, Port Lions areas. Impacts on the Kenai and Homer areas remain much as in the proposal (sec. IV.A.2.),

Conclusion: Very mild economic impacts would likely occur in the Kodiak and Port Lions areas with this alternative. Mild impacts would be likely in the Kenai area, while moderate impacts would be likely in the Homer area (see sec. IV.A.2.i.).

Cumulative Effects: Cumulative impacts on Kodiak from future projects could, with a very low likelihood, invite local short-run boom economic conditions. Cumulative impacts in the Kenai-Cook Inlet Census Division would, as noted in the proposal (sec. IV.A.2.1.), likely be mild. Petroleum development infrastructure in the Kenai area is well prepared for additional petroleum discoveries; hence, any induced changes would likely be mild.

Unavoidable Adverse Effects: There would be no unavoidable adverse impacts.

j. Impacts on Cultural Resources: This alternative would result in reduction of potential impacts on cultural resources, especially in the shore area near the deleted blocks at Anchor Point, Kamishak Bay, Karluk, and the Barren Islands. The oilspill risk drops from high to low for cultural resources. Thus, this alternative would result in reduced impacts due to oilspills.

Conclusion: There would be some reduction in potential impacts as a result of this alternative.

Cumulative Effects: There would be a reduction in potential impacts due to the proposed lease sale and other projects, as identified in section IV.A.1.h.

Unavoidable Adverse Effects: The unavoidable adverse effects which would occur as a result of this alternative would be reduced from those of the proposal.

k. Impacts on Visual, Wilderness, and Recreation Resources: Because blocks in Shelikof Strait are deleted, there would likely be insignificant impacts on visual, wilderness, and recreation resources along the strait, or on Kodiak Island near Port Lions, or near Kodiak City. The probability of an oilspill reaching the beaches hear Swikshak, a recreational

clamming area, would be reduced by about 85 percent with this alternative (compared to the proposal). Impacts on the Kenai Peninsula and Cook Inlet would be the same as those described in section IV.A.2.k. (proposal).

Conclusion: Same as above.

Cumulative Effects: Cumulative effects would be the same as for the proposal (sec. IV.A.2.k.).

Unavoidable Adverse Effects: Except for the Shelikof Strait area, where no impacts would occur, unavoidable adverse effects would be the same as for the proposal (sec. IV.A.2.k.).

1. Impacts on Land Status and Land Use:

Conclusion: With alternative IV, impacts on land status and land use on the Kenai Peninsula would be much the same as with the proposal (sec. IV.A.2.1.). However, no land status or land use impacts on the Kodiak Archipelago would be likely because the Shelikof Strait portion of the proposed lease sale would be deleted.

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

m. Impacts on Transportation Systems: The impact of alternative IV would be to confine impacts to Anchorage and the Kenai Peninsula. Impacts on the transportation systems of these two areas would be similar to, but slightly reduced, from that of the proposal (sec. IV.A.2.m.). Fewer construction materials and personnel would be needed with this alternative. Total volume of traffic resulting from this alternative would be approximately one-third less than that which would be caused by the proposal.

Conclusion: Alternative IV would reduce transportation impacts on Anchorage and the Kenai Peninsula.

Cumulative Effects: With the exception of Port Lions, cumulative effects would be similar to those outlined in section IV.A.2.m. (proposal).

Unavoidable Adverse Effects: The unavoidable adverse impacts which would occur as a result of alternative IV would be: 1) localized traffic congestion on the Sterling Highway; and 2) an increase of tanker traffic in the Cook Inlet and Gulf of Alaska.

n. Impacts on the Alaska Coastal Management Program:

Conclusion: With this alternative, the impacts on the State Coastal Zone Management Program as well as the Kenai Peninsula Borough District Coastal Management Program would likely be the same as with the proposal (sec. IV.A.2.n.). Alternative IV would not affect the Kodiak Island Borough because most of the Shelikof Strait blocks would be deleted. Coastal development would not, therefore, occur in Kodiak Island Borough. Refer to the discussion of the petroleum development scenarios described in section II.B.1.a. (proposal) and section II.B.4. (alternative IV).

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

o. Impacts on Water Quality:

Conclusion: With this alternative, the impacts on water quality would be substantially the same as with the proposal (sec. IV.A.2.o.). Any water quality effects would be limited to the Cook Inlet area alone.

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

b. Impacts on Air Quality: With this alternative, impacts on air quality would be substantially the same as with the proposal (sec. IV.A.2.p.).

Conclusion: Impacts which would occur as a result of this alternative would be the same as those described for the proposal (sec. IV.A.2.p.).

Cumulative Effects: The cumulative effects which would occur as a result of this alternative would be the same as those described for the proposal (sec. IV.A.2.p.).

Unavoidable Adverse Effects: The unavoidable adverse effects which would occur as a result of this alternative would be the same as those described for the proposal (sec. IV.A.2.p.).

6. Alternative V (53 blocks): Modify the proposal by deletion of 81 blocks in Shelikof Strait and 19 blocks in Cook Inlet. The following sections assess the impacts of oil and gas leasing for alternative V (see fig. II.B.5.a.-1.).

a. Impacts on Vulnerable Coastal Habitats: The chance of oilspills and oilspill risks to coastal habitats are essentially the same as those for alternative IV (sec. IV.A.5.a.).

Conclusion: The impacts on the coastal habitats of alternative V are the same as for alternative IV (sec. IV.A.5.a.).

Cumulative Effects: The cumulative impacts on coastal habitats of alternative V are the same as for alternative IV.

Unavoidable Adverse Effects: The unavoidable impacts, and the benefits of mitigating measures for alternative V are the same as for alternative IV.

b. Impacts on Commercial and Sport Fish: Deletion of additional blocks off Cape Douglas and west of Stevenson Entrance could reduce slightly the risk of potential oilspill contact on fin and shellfish species in the Shelikof Strait and lower Cook Inlet areas.

An area of high risk of oilspill contact (Kukak Bay-Kinak Bay area) identified in section IV.A.2.b. (proposal) has a slightly reduced chance (8% versus 5%) of being contacted by an oilspill with this alternative (appendix D, tables 15 and 16, no. 45).

Conclusion: This alternative slightly reduces potential impacts to the Shelikof Strait and Cook Inlet commercial and sport fish populations.

Cumulative Effects: Potential oilspill risks from this proposed lease sale combined with existing hydrocarbon activity would be reduced very slightly with this alternative compared to the proposal (sec. IV.A.2.b.).

Unavoidable Adverse Effects: This alternative should have about the same unavoidable impacts as the proposal (sec. IV.A.2.b.).

c. Impacts on Commercial Fishing:

Conclusion: The impacts, based on this alternative would remain essentially the same as described for alternative IV. It may slightly, but not significantly, reduce the chance of oil reaching the eastern side of Afognak Island.

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

d. Impacts on Marine and Coastal Birds: This alternative could result in a slight reduction of oilspill risk to marine and coastal birds in the Shelikof Strait compared to alternative IV. (sec. IV.A.5.d.) and a significant reduction of impacts on marine and coastal birds of Shelikof Strait compared to the proposal (appendix D, tables 14, 16, 8, and 10). Risk of spill contact with the Barren Islands and lower Cook Inlet bird populations would be about the same as those described for the proposal and for alternative IV.

An area of high risk of oilspill contact (Kukak Bay-Kinak Bay area) in the proposal analysis has a slightly reduced chance (8% versus 5%) of being contacted by an oilspill with this alternative (appendix D, tables 15 and 16, no. 45).

Conclusion: This alternative results in about the same oilspill risks as alternative IV. Potential impacts to the Shelikof Strait bird populations and habitats should be reduced only slightly in comparison to alternative IV. Potential impacts on the Barren Islands and lower Cook Inlet bird populations would be about the same as those impacts described in the proposal.

Cumulative Effects: This alternative would have about the same cumulative effects as alternative IV.

Unavoidable Adverse Effects: This alternative would have about the same unavoidable impacts as alternative IV.

e. Impacts on Marine Mammals: Comparison of tables 9 and 10 or of tables 15 and 16, appendix D, shows that alternative V generally would result in a reduced probability of oilspills below that of the proposal. In comparison to alternative V, this alternative would result in a 6 percent reduction of oilspill risk (from 17% 11%) to the north-northwestern Kodiak Archipelago.

It is likely that sea otters would sustain mortality and/or food source deterioration as a result of this alternative, particularly in the Kamishak Bay-Augustine Island area. It is possible that noise and disturbance could affect marine mammals as a result of this alternative, especially sea lion or harbor seal populations located or concentrated on the Barren Islands or along the coast of lower Cook Inlet.

Conclusion: Alternative V would afford substantial reduction of risk of oilspills and related effects to major sea otter and certain harbor seal habitats, particularly those in the northern Kodiak Archipelago and Shelikof Strait as compared to the proposal. Greater protection of sea lion hauling and feeding areas in Shelikof Strait would be achieved. An uncertain, but probably minimal reduction of risk to fur seals would result. Oilspill-related effects on marine mammals in lower Cook Inlet would be relatively the same as those described for the proposal (sec. IV.A.2.e.), although reduced somewhat in terms of spill contact probabilities. Reduced localized impacts of spills and disturbance on eastern Kodiak Island marine mammal habitats would be expected since no tanker facilities would be constructed in the vicinity. This alternative would reduce the potential for disturbance of sea lions and harbor seals of Shelikof Strait, as well as on eastern Kodiak Island, as compared to the proposal.

Cumulative Effects: Cumulative spill probabilities in the northern Kodiak Archipelago, eastern Kenai peninsula, Barren Islands, Anchor Point vicinity, and Kamishak Bay remain high under alternative V.

Kamishak Bay-Augustine Island sea otter and harbor seal populations would be subjected to a 75 percent probability of spill contact as a result of this alternative (appendix D, table 10, area H). Reduction of cumulative oilspill probabilities would be achieved, primarily in Shelikof Strait and the northern Kodiak Archipelago. Refer to the "Cumulative Effects" evaluation for alternative IV, which is essentially applicable to alternative V.

Unavoidable Adverse Effects: Refer to the "Unavoidable Adverse Effects" evaluation for alternative IV (sec. IV.A.5.e.), which is essentially applicable to alternative V.

f. Impacts on Endangered Species and Non-Endangered Cetaceans: See section IV.A.2.f. for a general discussion of impacts. Alternative V would reduce risks of oilspills to certain areas as compared to the proposal and would result in additional reduction of oilspill contact probability over that afforded by alternative IV to the northwest and northern Kodiak Archipelago, Barren Islands, and eastern Kenai Peninsula (appendix D, table 10, areas B, C, D). This alternative would provide substantial reduction of oilspill risk to the northwest and northern Kodiak Archipelago nearshore environments, and to cetacean habitats in those areas as compared to the proposal (11% chance versus 48%). (NOTE: Unless otherwise specified, oilspill risk analyses made in this section refer to probabilities conditional on the development of a production field and to spill contact rates within 10 days of simulated launch.) As with alternative IV, this alternative would reduce risks to certain areas used by cetaceans on the eastern side of Shelikof Strait (appendix D, tables 16, nos. 12, 13, 14), but not significantly more than would alternative IV. As with alternative IV, this alternative would do little to reduce risk to a possible beluga wintering area in lower Cook Inlet (i.e.,

Kamishak Bay), but would reduce localized effects in the Talnik Point-Marmot Bay area. Therefore, it is possible that endangered and non-endangered cetaceans would sustain direct and indirect effects, particularly in areas of high risk of contact. Since risks are somewhat lower than those described for the proposal, the impacts would occur less frequently. No negative effects would likely be sustained by Aleutian Canada geese as a result of this alternative.

Conclusion: It is possible that endangered and non-endangered cetaceans would sustain direct and indirect effects due to oilspill occurrence in areas of high risk of contact such as the northern Kodiak Archipelago and Kamishak Bay. Cumulative probabilities of spills would be high in those areas. However, effects of oilspills on whales may be less than those of the proposal. This alternative poses less risk of localized effects of oilspills or disturbance than the proposal on the eastern side of Kodiak Island and in Shelikof Strait. It is possible that cetaceans may sustain negative effects as a result of disturbance, but probably to a lesser extent than would be incurred under the proposal. There is no evidence at this time to suggest significant impacts of this alternative on endangered birds.

Cumulative Effects: Cumulative oilspill risk as a result of alternative V (conditional on realization of production phases) plus the existing sale is relatively high for the northern and northwest Kodiak Archipelago, Barren Islands, and eastern Kenai Peninsula (appendix D, table 10, areas B, C, D), and of medium risks for land segments in eastern Shelikof Strait (appendix D, table 16, nos. 12, 13, 14). Thus, alternative V would do little to reduce cumulative oilspill effects in these areas which may be of importance to endangered cetaceans. Alternative V may reduce cumulative disturbance and/or indirect effects (sec. IV.A.2.f.), particularly for species frequenting the eastern side of Kodiak Island. Localized reduction (as compared to the proposal) of cumulative oil pollution or disturbance could occur, particularly in Shelikof Strait, Kupreanof Strait, and the Talnik Point-Marmot Bay area. Cumulative effects of oilspills or disturbance on the Aleutian Canada geese would not likely occur as a result of this alternative.

Unavoidable Adverse Effects: The degree or type of unavoidable effects on endangered and non-endangered whales as a result of this alternative is unknown. No unavoidable adverse impacts are expected to be sustained by Aleutian Canada geese as a result of this alternative.

g. Impacts on Terrestrial Mammals: This alternative would allow the same degree of protection or reduction of potential impacts on terrestrial mammals and their coastal habitats as alternative IV (sec. IV.A.5.g.). Oilspill trajectory analyses for this alternative are very similar to alternative IV (sec. IV.A.1.d. and appendix D, tables 15 and 16). Oilspill probabilities for coastal habitats in Shelikof Strait are significantly reduced from those for the proposal (appendix D, tables 14 and 16). The probabilities of an oilspill contacting Kamishak Bay and other coastal areas in lower Cook Inlet are the same or nearly the same as those for the proposal (appendix D, tables 14 and 16, nos. 53 and 54).

Conclusion: This alternative would have essentially the same impacts on terrestrial mammals as alternative IV (sec. IV.A.5.g.); therefore, this alternative would reduce potential impacts as described for the proposal (sec. IV.A.2.g.). The overall impacts on terrestrial mammals would be minor.

Cumulative Effects: This alternative would have about the same cumulative impacts as alternative IV. Cumulative effects on terrestrial mammals in Shelikof Strait would be reduced, but the terrestrial mammals of the lower Cook Inlet area would be subject to the same degree of cumulative impacts as the proposal.

Unavoidable Adverse Effects: This alternative would have the same unavoidable impacts on terrestrial mammals as alternative IV. Unavoidable oil pollution of terrestrial mammals and their coastal habitats would be reduced in the Shelikof Strait area, but not in the lower Cook Inlet area where terrestrial mammals would be exposed to the same unavoidable impacts as with the proposal.

h. Impacts on Social Factors:

(1) Impacts on Population: With this alternative, population impacts on Port Lions and Kodiak would be removed and population impacts on Homer and Kenai-Soldotna would be moderated somewhat. Homer would still be the community in Cook Inlet with the most substantial population impacts. See section IV.A.2.h.(1).

Conclusion: Population impacts would be removed from Kodiak and Port Lions and would likely be reduced for communities in Cook Inlet. Homer would still be the most affected community in Cook Inlet. Kenai and Soldotna impacts would be insignificant.

Cumulative Effects: With this alternative only Homer would be significantly affected.

Unavoidable Adverse Effects: The effects on Homer would be the same as for the proposal (see sec. IV.A.2.h.(1)). Kenai and Soldotna would experience no adverse effects due to the small additions of population. Unavoidable adverse effects on Port Lions and Kodiak would be significantly moderated.

(2) Impacts on Sociocultural Systems: This alternative would result in a significant reduction in sociocultural impacts. Kodiak would experience fewer conflicts concerning joint fisheries, and OCS utilization of goods, services, and space. Local competition for jobs associated with OCS facility construction, potentially leading to racial conflict would be minimized. Impacts on the community of Homer would also be moderated by the reduced likelihood of major construction projects in the Homer area resulting from a smaller proposed lease sale.

Conclusion: This alternative would result in a reduction of impacts on the sociocultural systems of Kodiak, Port Lions, and Homer. Kenai-Soldotna would still experience largely beneficial, mild impacts.

Cumulative Effects: Cumulative effects on the communities of Kodiak and Port Lions would be minimized. Homer would likely experience moderate social conflict induced by continued Cook Inlet lease area exploration and possible development.

Unavoidable Adverse Effects: Moderate social conflict and controversy could occur in Homer. No unavoidable adverse effects for the other communities would likely occur.

(3) Impacts on Community Infrastructure - Impacts on the Kenai, Homer, Kodiak, and Port Lions Areas: With this alternative, impacts would be confined to the Kenai and Homer areas. These impacts would be similar to those described for the proposal (sec. IV.A.2.h.(3)), but would be slightly reduced.

Conclusion: Community infrastructure impacts would be limited to the Kenai and Homer areas and are described in section IV.A.2.h.(3). There would be no impacts in the Kodiak and Port Lions areas.

Cumulative Effects: Cumulative impacts would be confined to the Kenai and Homer areas and are described in section IV.A.2.h.(3). There would be no impacts in the Kodiak and Port Lions areas.

Unavoidable Adverse Effects: See section IV.A.2.h.(3) for the Kenai and Homer areas only.

(4) Impacts on Subsistence: With this alternative, impacts on village subsistence use areas, both in Cook Inlet and Shelikof Strait would be moderated. The reduction in exploratory drilling sites and deletion of blocks in Shelikof Strait would contribute to this low impact. See discussion for the proposal (sec. IV.A.2.h.(4).

Cumulative Effects: With the addition of sale CI leased tracts, the statistical risk of oilspill contact would be reduced for Shelikof Strait villages, English Bay, and Port Lions. See discussion under the proposal (sec. IV.A.2.h.(4)).

Unavoidable Adverse Effects: This alternative would minimize the unavoidable adverse effects on subsistence use areas both in Cook Inlet and along Shelikof Strait.

i. Impacts on the State, Regional, and Local Economies: With this alternative, impacts would be confined to the Kenai and Homer areas. These impacts would be similar, but less severe, than those described for the proposal (sec. IV.A.2.i.).

Conclusion: Economic impacts on Kodiak and Port Lions would be mild as would impacts on the Kenai area. Impacts on the Homer area would result in relatively rapid increases in the area's economy and employment.

Cumulative Effects: Cumulative effects would be similar to those described for alternative IV (sec. IV.A.5.1.).

Unavoidable Adverse Effects: As in alternative IV, much the impact would be mild to moderate, relatively non-disruptive, permanent economic growth. As in the proposal (sec. IV.A.2.i.), mild economic growth could result in Kenai, moderate growth could occur in the Homer area.

j. Impacts on Cultural Resources: This alternative would result in a considerable reduction in risk from oilspills or other disturbance to cultural resources as compared to the proposal. The USGS oilspill risk analysis (appendix D) shows that risk to cultural resources would drop from high to low with this alternative.

Conclusion: This alternative would result in a reduction in risk to cultural resources. Impact would be low for this alternative.

Cumulative Effects: Cumulative effects on cultural resources would be minimal with this alternative.

Unavoidable Adverse Effects: The unavoidable adverse effects which would occur as a result of this alternative would be reduced from those of the proposal.

k. Impacts on Visual, Wilderness, and Recreation Resources:

Conclusion: With this alternative, impacts would be similar to those described for alternative IV (sec. IV.A.5.k.).

Cumulative Effects: Refer to section IV.A.5.k.

Unavoidable Adverse Effects: Refer to section IV.A.5.k.

l. Impacts on Land Status and Land Use:

Conclusion: With this alternative, impacts on land status and land use would be substantially the same as under the proposal (sec. IV.A.2.l.). However, no land status or land use impacts on the Kodiak Archipelago would likely occur because of deletion of the Shelikof Strait portion of the proposal.

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

m. Impacts on Transportation Systems: Impacts which would result from alternative V would be substantially the same as described in section IV.A.5.m.

Conclusion: Same as section IV.A.5.m.

Cumulative Effects: See section IV.A.5.m.

Unavoidable Adverse Effects: See section IV.A.5.m.

n. Impacts on the Alaska Coastal Management Program:

Conclusion: With this alternative, impacts on coastal zone management would be the same as those described for alternative IV. Refer to section IV.A.5.i.

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

o. Impacts on Water Quality:

Conclusion: Under alternative V, the impacts on water quality would be substantially the same as under the proposal (sec. IV.A.2.o.). Any water quality effects would be limited to the Cook Inlet area alone.

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

p. Impacts on Air Quality: Under alternative V, impacts upon air quality would be substantially the same as under the proposal (sec. IV.A.2.p.).

Conclusion: Impacts which would occur as a result of this alternative would be the same as those of the proposed action (sec. IV.A.2.p.).

Cumulative Effects: The cumulative effects which would occur as a result of this alternative would be the same as those of the proposed action.

Unavoidable Adverse Effects: The unavoidable adverse impacts which would occur as a result of this alternative would be the same as those of the proposed action (sec. IV.A.2.p.).

7. Alternative VI (68 blocks): Modify the proposal by deletion of the 85 blocks in lower Cook Inlet: The following sections assess the impacts of further oil and gas leasing in only Shelikof Strait (see fig. II.B.6.a.-1).

a. Impacts on Vulnerable Coastal Habitats: This alternative poses risks to the lower Cook Inlet and Shelikof Strait coastal habitat that are similar to the impacts of the entire proposal. The most likely number of spills in Shelikof Strait is three; however, another seven spills are most likely to result from the past leasing and existing tanker routes in lower Cook Inlet (appendix D). The distribution of the coastal impact of these is similar to the impact of the proposal because the spills may originate in both lower Cook Inlet and Shelikof Strait.

Conclusion: The leasing in only Shelikof Strait, as proposed with alternative VI, poses comparatively similar risks to the coastal habitats in Shelikof Strait and comparatively great risks to Marmot Bay as discussed in the proposal (sec. IV.A.2.a.).

Cumulative Effects: In comparison with the proposal, alternative VI poses approximately equal cumulative risks to the coastal habitats in Shelikof Strait and lower Cook Inlet.

Unavoidable Adverse Effects: The unavoidable impacts of this alternative are similar to those associated with the entire proposal (sec. IV.A.2.a.).

b. Impacts on Commercial and Sportfish: Deletion of the lower Cook Inlet blocks with this alternative could result in reduced potential oil pollution impacts on fin and shell fish populations and habitats in the lower Cook Inlet. Oilspill risk probabilities for pink salmon spawning habitats and juvenile foraging areas are high already due to existing leasing and tankering activities in Cook Inlet. This alternative would add no further risk.

Conclusion: Deletion of the lower Cook Inlet blocks could result in reduced potential impacts from oil pollution on pink salmon spawning and rearing habitats. However, these areas are at comparatively high risk from existing

hydrocarbon activities. Fish populations and habitats in Shelikof Strait could suffer the same potential impacts as described for the proposal (sec. IV.A.2.b).

Cumulative Effects: Activities related to this alternative in addition to existing oil and gas activities in Cook Inlet could result in somewhat reduced impacts on fish populations and habitats in the lower Cook Inlet and Barren Islands areas from those cumulative effects described in section IV.A.2.b. (proposal). However, this alternative would probably have about the same degree of cumulative effects as the proposal on fin and shellfish populations occurring in the Shelikof Strait.

Unavoidable Adverse Effects: Those unavoidable impacts described for the proposal (sec. IV.A.2.b.) could be reduced for lower Cook Inlet populations and habitats with this alternative. However, the same unavoidable effects described for the proposal would probably occur for Shelikof Strait fish populations.

c. Impacts on Commercial Fishing: With this alternative, impacts on commercial fishing in Shelikof Strait would be the same as discussed for the proposal (sec. IV.A.2.c.). Fisheries located from Uganik to Malina Bays face the greatest risk of being adversely affected by an oilspill. Impacts could include fouled fishing gear and fish, and competition for ocean space, dock space, labor, and materials. Refer to sections IV.A.2.b. and IV.A.2.c. (proposal) for a more detailed discussion of these impacts.

While the impacts assessed for lower Cook Inlet may be reduced with this alternative, the level of oil and gas related activities presently occurring in the area, and future activities envisioned for the area would probably result in only slightly reduced impacts. There may be some reduction of potential impacts in the Polly Creek area of Cook Inlet (clams) and Kamishak Bay (crab fishing), but, overall, impacts would not be significantly reduced.

Cumulative Effects: Cumulative impacts would be essentially the same as those discussed for the proposal (sec. IV.A.2.c.).

Unavoidable Adverse Effects: With the exception of lower Cook Inlet, where impacts may be reduced, unavoidable and adverse impacts would be similar to those identified for the proposal (sec. IV.A.2.c.).

d. Impacts on Marine and Coastal Birds: This alternative could reduce potential oil pollution impacts on marine and coastal bird populations and habitats within the lower Cook Inlet area and the Barren Islands. Oilspill risk probabilities for coastal habitats and offshore foraging areas are significantly reduced (appendix D, table 26). Coastal habitats in Kamishak Bay, Augustine Island, Anchor Point, and the Barren Islands are less likely to be contacted by oil if the lower Cook tracts are not leased. However, these areas are at high risk from the existing leasing and existing tankering activities.

Bird populations and habitats in Shelikof Strait area are at high risk from oilspills with this alternative. If a large spill occurs, the bird populations that occur in the bays, nearshore areas, and offshore foraging areas of Shelikof Strait could suffer high mortalities as indicated by the high oilspill probability risks, 46-49 percent for this alternative (appendix D, tables 26 and 29, fig. D).

This alternative could reduce disturbance of nesting birds in the lower Cook Inlet area by reducing marine and air traffic somewhat from what would occur with the proposal. However, disturbance of bird colonies in the Shelikof Strait could still occur.

Conclusion: Deletion of the lower Cook Inlet tracts could reduce the potential impacts from oil pollution and disturbance on marine and coastal birds and their habitats in that area and the Barren Islands. However, these areas are comparatively high risk from existing hydrocarbon activities. Bird populations and habitats in Shelikof Strait could suffer the same potential impacts as described in the proposal.

Cumulative Effects: This alternative could reduce somewhat the combined effects of the proposal, plus the existing lease area and existing tankering on bird populations and habitats in the lower Cook Inlet and Barren Islands areas from those cumulative effects described in the proposal. However, this alternative will probably have about the same degree of cumulative effects as the proposal on bird populations occurring in the Shelikof Strait areas (see tables 27, 28, 30, and 31).

Unavoidable Adverse Effects: Those unavoidable impacts described in the proposal could be reduced for the lower Cook Inlet and Barren Islands populations and habitats with this alternative. However, the same unavoidable effects described in the proposal would probably occur for the Shelikof Strait bird populations with this alternative.

e. Impacts on Marine Mammals: Refer to section IV.A.2.e. for a general discussion of impacts. Alternative VI would expose the northern and northwestern Kodiak Archipelago to high spill risks which are substantially less than that of the proposal (appendix D, 35% chance, alternative VI versus 48% chance, alternative I; tables 26 and 8, respectively), but greater than those of alternative IV or V (17% and 11% chance respectively, area D). Western shores of Shelikof Strait would be exposed to less chance of contact compared to the proposal (appendix D, 11% chance, alternative VI versus 17% alternative I; tables 26 and 8, respectively, area E), but greater than would be incurred under alternative IV or V (5% and 4% chance, respectively). Marine mammal habitats in lower Cook Inlet (e.g., Kamishak Bay-Augustine Island, Anchor Point, and southwestern Kenai Peninsula) would be afforded additional protection. Appendix D, table 26 shows that the probability of spill contact over the life of the field in the Kamishak Bay-Augustine Island nearshore environments (area H) would be 2 percent as compared to 33 percent under the proposal. Similarly, the Anchor Point area (area G) would be subjected to virtually no chance of spills as compared to 13 percent of the proposal. Also, marine mammal habitats of the Barren Islands would be subjected to less risk, at a substantially lower probability than would be effected by the proposal or alternative IV (appendix D; alternative I; 11% chance; alternative IV; 10% chance; alternative VI; 1% chance, tables 8, 9, and 26, respectively, area C).

Conclusion: Alternative VI would reduce spill effects (see sec. IV.A.2) on sea otter, harbor seal, and sea lions and their habitats of lower Cook Inlet and the Barren Islands, particularly those of the Kamishak Bay and Barren Island areas below levels which would be incurred under the proposal. Spill contact rates of the northern Kodiak Archipelago and Shelikof Strait marine

mammal habitats would be reduced below those of the proposal but not to the extent that would be accomplished through alternatives IV and V.

Due to probable tanker traffic to eastern Kodiak Island, spill risks to Portlock Bank would probably be higher under this alternative than what would be incurred under alternative IV and V. Therefore, in consideration of the probable ecological importance of Portlock Bank and nearshore marine habitats east of Kodiak Island to sea lions and fur seals, and of the importance of the northern Kodiak Archipelago to harbor seals and sea otters, this alternative would probably not provide as much overall long-term protection to marine mammals as would alternative IV or V. It is possible that noise and disturbance associated with exploration, development, and production phases of the proposed sale would affect sea lions and harbor seals, in particular those of Shelikof Strait and eastern Kodiak Island.

Cumulative Effects: Cumulative (alternative VI plus existing tracts) probabilities of spill contact for marine mammal habitats would remain moderate to high for most areas of marine mammal use, although these cumulative probabilities (appendix D, table 27) are 5-10 percent less than the cumulative probabilities that would be associated with the proposal (appendix D, table 8), and generally constitute a greater reduction than would be achieved by alternatives IV or V (compare to cumulative probabilities, appendix D, tables 9 and 10) except for the north Kodiak Archipelago (area D) and the Shelikof Strait (area E). Therefore, alternative VI may provide potential for reducing long-term cumulative oilspill related direct and indirect effects (sec. IV.A.5.e.) on marine mammals of lower Cook Inlet, but not necessarily for those of the northern Kodiak Archipelago (probably an area of greatest sea otter density) or Shelikof Strait. Since a pipeline to and tanker terminal on eastern Kodiak Island would be likely under this alternative, localized cumulative disturbance of harbor seals, sea lions, or sea otters in the Marmot Bay area as a result of this alternative could be higher than what would be incurred under alternative IV or V.

Unavoidable Adverse Effects: If the field goes into production, this alternative would result in direct mortality of sea otters, particularly in the north-northwestern Kodiak Archipelago as the result of oilspills. Such effects would generally be less than what would be expected under the proposal, but greater than under alternative IV or V. It is also possible that localized habitat deterioration and/or food source loss as a result of spills would occur, at least temporarily for sea otters and harbor seals of the northern Kodiak Archipelago. It is possible that unavoidable disturbance of sea lion or harbor seal concentration would occur as a result of long-term changes in transportation systems, localized impacts of facility construction, or localized short-term effects of aircraft, boat, or industrial noise.

f. Impacts on Endangered Species and Non-Endangered Cetaceans: See section IV.A.2.f. for a general discussion of impacts. Alternative VI would reduce oilspill risk and potential effects on cetaceans frequenting the northern Kodiak Archipelago below that of the proposal (35% chance alternative VI vs. 48% chance, alternative I; appendix D, tables 26 and 8, area D), but not below that which would occur for alternative IV or V (17% and 11% chance, respectively). (NOTE: unless otherwise specified, oilspill risk analyses made in this section refer to probabilities conditional on the development of a production field and to spill contact rates within 10 days of simulated

launch.) However, this alternative would subject the Barren Islands and eastern Kenai Peninsula to lower oilspill risk than would alternatives I, IV, and V. Areas of whale occurrence on the eastern shores of Shelikof Strait would be at 5-9 percent chance of oilspill contact for this alternative (appendix D, table 29, nos. 12, 13, 14) as compared to 1-4 percent for alternative IV. Therefore, alternative VI would minimize the potential for direct or indirect oilspill effects (sec. IV.A.2.f.) to areas which probably receive the most use by gray whales as compared to other alternatives but would not afford as much protection to areas of cetacean occurrence in the northern Kodiak Archipelago and Shelikof Strait as would alternatives IV or V. Appendix D, table 26, shows that the probability of spill contact over the life of the field in the Kamishak Bay-Augustine Island nearshore environments (area H) would be 2 percent compared to 33 percent under the proposal, and 29 and 26 percent under alternatives IV and V. Thus, direct and indirect effects of oilspills on wintering beluga whales would be less likely under alternative VI than under alternatives I, IV, or V. Localized oilspills and disturbance may occur in the vicinity of a tanker terminal located on the eastern side of Kodiak Island. It is possible, therefore, that cetaceans of eastern Kodiak Island habitats also would sustain negative effects as a result of spills or disturbance that may be associated with this alternative. Overall, effects would possibly exceed those described for alternatives IV or V.

Conclusion: It is possible that endangered and non-endangered cetaceans may sustain direct and indirect effects due to oilspill occurrence in areas of high risk of contact such as the northern Kodiak Archipelago. Risk of spill contact and effects in beluga wintering areas of lower Cook Inlet such as Kamishak Bay and gray whale habitats on the eastern side of the Kenai Peninsula would be substantially less than those under the proposal. However, cumulative probabilities of spills and potential effects would be high in the northern Kodiak Archipelago, eastern Kenai Peninsula, Barren Islands, and Kamishak Bay. Localized effects of oilspills and disturbances may be sustained in the vicinity of a tanker terminal located on the eastern side of Kodiak Island. It is possible, therefore, that cetaceans of eastern Kodiak Island habitats will also sustain negative effects as a result of oilspills and disturbance that may be associated with this alternative. This alternative would not cause significant impacts on endangered birds.

Cumulative Effects: Examination of appendix D, tables 8, 9, 10, and 26, indicates that alternative VI would lower cumulative (alternative VI plus existing lease sale) oilspill risk below that which would result from the proposal but not substantially below that which would result from alternatives IV and V for the eastern Kenai Peninsula and Barren Islands. This alternative would have higher (59% vs. 48%) cumulative spill probability on the northern Kodiak Archipelago than alternatives IV and V. The cumulative probability of oilspill contact in Kamishak Bay beluga whale wintering areas would remain high (67%) under this alternative (appendix D, table 26, area H). Therefore, alternative VI would not reduce cumulative oilspill effects on cetaceans in lower Cook Inlet and Shelikof Strait (sec. IV.A.2.f.) any more than alternatives IV and V.

This alternative would be expected to contribute to localized cumulative oilspills, noise, and other disturbance on the eastern side of Kodiak Island, particularly as may be associated with the tanker terminal near Marmot Bay and tankering of crude oil over the Portlock Bank.

Unavoidable Adverse Effects: The type and degree of unavoidable effects on endangered and non-endangered whales as a result of this alternative are unknown. No unavoidable adverse impacts would be expected to be sustained by Aleutian Canada geese as a result of this alternative.

g. Impacts on Terrestrial Mammals: This alternative would reduce oilspill risks to terrestrial mammals and their coastal habitats in the lower Cook Inlet area especially in Kamishak Bay. Brown bear spring-use areas in Kamishak Bay would face lower risk from oil contamination with this alternative. Coastal wintering areas for moose would also face less risk from oil pollution along the coast near Anchor Point. However, coastal habitats in Shelikof Strait showing a high probability of risk from oilspills, such as the Kukak Bay brown bear stream- and spring-use areas, and Raspberry and Uganik Islands deer wintering areas (graphic 9), with the proposal would also be at high risk with this alternative (refer to sec. IV.A.2.g.). The development scenario for this alternative includes an onshore pipeline from Chernof Point to Talnik Point and tanker terminal facilities at Talnik Point. There would be no gas pipeline to Nikiski; thus, impact to terrestrial habitat on the Kenai Peninsula would not occur on Kodiak Island. Disturbance of terrestrial mammals and their habitat due to onshore activities would still occur with this alternative as with the proposal (sec. IV.A.2.g.).

Conclusion: This alternative could reduce potential impacts on terrestrial mammals and their coastal habitats in the lower Cook Inlet portion. The terrestrial mammals in the Shelikof Strait portion of the proposed lease area would face the same risk as described in section IV.A.2.g. (proposal). Overall, impacts on terrestrial mammals would be minor.

Cumulative Effects: Although lower Cook Inlet terrestrial mammal resources would be at less risk from oil pollution with this alternative than with the proposal or with alternatives IV and V, the combined effects of this alternative plus the effects of the existing lower Cook Inlet lease area and existing tankering would be about the same as the proposal for the lower Cook Inlet portion of the proposed lease area. This alternative would have about the same cumulative effects on terrestrial mammal resources of the Shelikof Strait area as the proposal.

Unavoidable Adverse Effects: This alternative would have the same unavoidable adverse impacts on Shelikof Strait terrestrial mammals populations as the proposal. However, fewer terrestrial mammals would be unavoidably affected in the lower Cook Inlet area than with the proposal or with alternative IV or V.

h. Impacts on Social Factors:

(1) Impacts on Population: This alternative would result in the same impacts as those described for the proposal (sec. IV.A.2.h.(1)) for Kodiak and Port Lions. For Kenai, Soldotna, and Homer, population impacts would be eliminated.

Conclusion: Population impacts would be the same as described for the proposal (sec. IV.A.2.h.(1)) for Kodiak and Port Lions. These impacts would be major for Port Lions and less serious for Kodiak. This alternative would eliminate population impacts on Homer, Kenai, and Soldotna.

Cumulative Effects: Cumulative impacts would be the same as the proposal for Kodiak and Port Lions (see table IV.A.2.h.(1)-2). For Homer, Kenai, and Soldotna, cumulative impacts would be equal to the base case. See table IV.A.2.h.(1)-3.

Unavoidable Adverse Effects: For Kodiak and Port Lions, unavoidable adverse effects would be similar to those described in section IV.A.2.h.(1) (proposal). There would be no unavoidable adverse effects for Homer, Kenai, and Soldotna.

(2) Impacts on Sociocultural Systems: Deletion of blocks and associated exploratory and development activity in Cook Inlet would reduce the potential conflict associated with the proposal for the community of Homer. Impacts on Kodiak, Port Lions, and other Shelikof Strait communities would continue. See discussion under the proposal, sections IV.A.2.h.(1) and (3).

Conclusion: This alternative is equivalent to alternative I (the proposal) in its effects on Kodiak, Port Lions, and other Shelikof Strait communities. Impacts on Homer and Kenai-Soldotna would be moderate.

Cumulative Effects: Cumulative effects would be major in Kodiak-Port Lions, and would be eliminated in Homer, Kenai, and Soldotna.

Unavoidable Adverse Effects: Unavoidable adverse effects resulting from this alternative would include social conflict leading perhaps to increased racial conflict, moderate job shifting during construction seasons for Kodiak, Port Lions, and perhaps mild job shifting in other Shelikof Strait villages. Unavoidable adverse effects in Homer would be eliminated.

(3) Impacts on Community Infrastructure - Impacts on the Kenai, Homer, Kodiak, and Port Lions Areas: Alternative VI eliminates all impacts on Kenai and Homer areas. Impacts on the community infrastructure in the Kodiak and Port Lions areas would be as described for the proposal (sec. IV.A.2.h.(3)).

Conclusion: Impacts on community infrastructure in the Kenai and Homer areas would be non-existant. Impacts to the Kodiak and Port Lions areas would be as described for the proposal (sec. IV.A.2.h.(3)).

Cumulative Effects: Cumulative impacts on community infrastructure in the Kenai and Homer areas would be non-existent. Cumulative impacts on Kodiak would be about the same as those outlined for the proposal (sec. IV.A.2.h.(2)).

Unavoidable Adverse Effects: Impacts would be limited to the Kodiak and Port Lions areas as described in section IV.A.2.h.(3).

(4) Impacts on Subsistence: In spite of the fact that petroleum-related activity in Shelikof Strait would be about the same as for the proposal, the risk calculations on subsistence use areas for this alternative show it to be less hazardous to subsistence areas in Shelikof Strait than the proposal itself. Cook Inlet subsistence use areas are also face less risk under this alternative. See figure IV.A.1.d.-9.

This reduction in risk to subsistence use and take areas would reduce the likelihood of the disruption of local village economies resulting from an oilspill.

Cumulative Effects: When both the cumulative effect of sale CI leasing activity and the effect of existing and proposed tankering are calculated, using the oilspill risk analysis model, two areas on either side of Shelikof Strait (Kupreonof Strait and Cape Gull) show high oilspill risk, and five areas along the strait at Ugak Bay, Uganik Island, Black Cape, Afognak Island, Cape Kulak, and Douglas Reef show medium risk (fig. IV.A.d.-14).

In Cook Inlet, two areas in Kamishak Bay and Augustine Island show high risk of oilspill contact, and four points show medium risk. The cumulative case of this alternative is less hazardous than the cumulative case with the proposal. With this cumulative case, two areas along Shelikof Strait would be at high risk, only one of which would result in oilspill impacts on the subsistence use area of villages located along Kupreanof Strait. This minimizes the likelihood of disruption of subsistence activities and take in the event of an oilspill.

Under the cumulative case, seven areas in Cook Inlet show high oilspill risk including two close to English Bay and Port Graham (Ushagat Island and English Bay). With this cumulative case only three areas in Kamishak Bay (away from heavily used subsistence areas) show high risk of oilspill contact, thus reducing the likelihood of disturbance to these village economies and their residents and activities.

Unavoidable Adverse Effects: Under this alternative, the unavoidable adverse effects of one or more probable oilspills, and their temporary to long-term disruption of subsistence use and take, would be minimized.

i. Impacts on the State, Regional and Local Economies: Alternative VI would eliminate all impacts on the Kenai and Homer areas because development would occur in the near Kodiak and Port Lions areas of the Shelikof Strait. Since gas would be reinjected, most economic impacts on Homer and Kenai areas would be eliminated. Impacts on Kodiak and Port Lions would remain as described for the proposal (sec. IV.A.2.i.).

Conclusion: Mild economic impacts in terms of employment and income would be likely in the Kenai and Homer areas. As for the proposal, major economic and employment impacts are likely in the Port Lions area, and mild impacts would likely occur in Kodiak.

Cumulative Effects: Cumulative impacts would be similar to those described in section IV.A.2.i. (proposal).

Unavoidable Adverse Effects: Unavoidable adverse impacts may or may not exist depending on ones view of the implications of an economic boom in the Port Lions area.

j. Impacts on Cultural Resources: Alternative VI could result in reduced risks to cultural resources. Reduction in traffic through Stevenson Entrance and Kennedy Entrance could reduce impacts on cultural resources of the Barrier Islands (graphic 13).

Conclusion: This alternative would result in improved conditions for preservation of cultural resources compared to the proposal. Impact is low for this alternative.

Cumulative Effects: Cumulative effects on cultural resources would be greatly reduced with this alternative.

Unavoidable Adverse Effects: The unavoidable adverse effects resulting from this alternative would be reduced compared to those described for the proposal (sec. IV.A.2.j.).

k. Impacts on Visual, Wilderness, and Recreation Resources:

Conclusion: This alternative would result in a reduction of impacts on the visual, wilderness, and recreation resources of Cook Inlet (see sec. IV.A.2.k.). Since petroleum-related activity in Shelikof Strait would be similar to that described for the proposal, impacts on visual, wilderness, and recreation resources would be the same as for the proposal (sec. IV.A.2.k.).

Cumulative Effects: Cumulative effects on visual, wilderness, and recreation resources on Cook Inlet would be slightly reduced with this alternative. Effects of these resources on Shelikof Strait, Kodiak Island, and the Alaska Peninsula would be as described in section IV.A.2.k. (proposal).

Unavoidable Adverse Effects: Unavoidable adverse effects would be the same as those described in section IV.A.2.k. but would be slightly reduced for Cook Inlet.

l. Impacts on Land Status and Land Use:

Conclusion: With alternative VI, impacts on land status and land use of the Kodiak Archipelago would be substantially the same as under the proposal (sec. IV.A.2.l.). Impacts on the Kenai Peninsula area would include those described for alternative I (sec. IV.A.2.l.) regarding expansion of support and supply base activity at Homer and the possibility of spillover land use impacts on Homer.

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

m. Impacts on Transportation Systems: With this alternative, material flowing into the city of Anchorage and the Kenai Peninsula would be cut by nearly 50 percent. Additionally, there would be no need for an extensive labor force on the Kenai Peninsula as there would be no need to construct any major facilities.

With this alternative, impacts on Port Lions would be as great or greater than the proposal. Some increase in traffic in the Port Lions area could occur as a result of a natural tendency to support the entire operation from the closest possible support base. However, even in this case, routine supply operations from Port Lions would not be likely.

Conclusion: As a result of this alternative, impacts would be substantially reduced in Anchorage and the Kenai Peninsula. Impacts on Port Lions would be the same as those described for the proposal.

Cumulative Effects: See section IV.A.2.m. (proposal).

Unavoidable Adverse Effects: Unavoidable adverse impacts would be the same as those described in section IV.A.2.m., with the exception that this alternative would cause no traffic congestion on the Sterling Highway and would cause no increase in Cook Inlet tanker traffic.

n. Impacts on the Alaska Coastal Management Program:

Conclusion: With alternative VI, impacts on the State Coastal Zone Management Program, the Kodiak Island Borough District Management Program (CMP), and Kenai Peninsula Borough CMP would be similar to those impacts described for the proposal (sec. IV.A.2.n.). The Kodiak Island Borough could be the site of an exploration support base instead of the Kenai Peninsula Borough because the lease tracts would be located principally in the Shelikof Strait, and no oil terminal and/or processing facilities would be located on the coastal zone of the Kenai Peninsula Borough with this alternative. However, other aspects of the petroleum development scenario described and assessed in section IV.A.2.n. (proposal), apply to alternative VI.

Cumulative Effects: Cumulative effects would be the same as described in section IV.A.2.n., with exceptions noted above.

Unavoidable Adverse Effects: Same as above.

o. Impacts on Water Quality:

Conclusion: With this alternative, impacts on water quality would be substantially the same as described for the proposal (sec. IV.A.2.o.). Any water quality impacts would be limited to the Shelikof Strait area alone.

Cumulative Effects: Same as above.

Unavoidable Adverse Effects: Same as above.

p. Impacts on Air Quality: With this alternative, impacts on air quality would be localized on the northern coastline of Kodiak Island between Chernof Point and Talnik Point. Since there would be no Anchor Point facility, impacts on air quality would be eliminated for this area.

Conclusion: Air emissions which would occur as a result of this alternative would be localized on the northern coastline of Kodiak Island.

Cumulative Effects: The cumulative effects which would occur as a result of this alternative would be the same as those of the proposal (sec. IV.A.2.p.) except there would be no petroleum-related air quality impacts in the Anchor Point area.

Unavoidable Adverse Effects: The unavoidable adverse impacts which would occur as a result of this alternative would be the same as those of the proposal (sec. IV.A.2.p.).

B. Relationship Between Local Short-term Uses and Maintenance and Enhancement of Long-term Productivity: In this section, the short-term effects and uses of various components of the environment of the lower Cook Inlet/ Shelikof Strait areas are related to long-term effects and the maintenance and enhancement of long-term productivity. The effects of the proposed action would vary in kind, intensity, and duration, beginning with preparatory activities (seismic data collection and exploration drilling) of oil and gas development, and ending when natural environmental balances might be restored.

In general, "short-term" refers to the useful lifetime of the proposal, but some even "shorter-term" uses and effects are considered. "Long-term" refers to that time beyond the lifetime of the proposal. The life of any oil and gas development in the lower Cook Inlet/Shelikof Strait has been estimated to be about 26 years. In other words, short-term refers to the total duration of oil and gas exploration and production, whereas long-term refers to an indefinite period beyond the termination of oil and gas production. This period will vary from one environmental component to another.

Many of the impacts discussed in sec. IV are considered to be short-term (being greatest during the construction, exploration, and early production phases), which could be further reduced by the mitigating measures discussed in section II.

Biological productivity would be lost in the short-term on all onshore lands used in the proposed project. These areas could be returned to productivity in the long-term with proper management. Restoration may not be entirely feasible; however, the overall loss would be a minor adverse effect. The direct land requirements, as shown in the development scenario, would show in both the short-term and the long-term because of disturbance. Some species may have difficulty repopulating and could be displaced.

Short-term oil pollution and the possibility of long-term cumulative oil pollution impacts could cause serious adverse effects on all components of the marine ecosystem, including fisheries. While restoration would allow fisheries production to regain original levels, any reduced annual harvests during the life of the project would be irretrievably lost. The extent is not known presently, but the potential must be recognized.

Freshwater pollution from onshore activities is a short-term effect. The long-term decrease in water quality may be considered to be a tradeoff for obtaining oil and gas resources.

The biota would be threatended in the short-term by potential oil pollution. Direct mortality could be significant through the combined effects of harassment by humans and increased volume and frequency of noise from vessel traffic or overflying aircraft. In the long-term, such disturbances could alter behavior patterns and could drive fauna away from traditional feeding and breeding grounds or to other critical areas within their range reducing species populations over a long period of time.

Habitat destruction could cause a reduction in subsistence species, such as salmon. This could threaten the regional economy. The improved accessibility to primitive areas from increased construction is a short-term result from this proposal. This overall wilderness value of the coast may decrease from

increased land use. Increased human populations in the short-term could change the regional Native culture in the long-term. The subsistence way of life could be modified and population shifts could occur. The overal changes cannot be termed positive or negative, except by those affected.

Archeologic and historic values discovered during development would enhance long-term knowledge. Overall finds may help to locate other sites, but, destrucion of artifacts would represent long-term losses.

Consumption of offshore oil and gas would be a long-term use of nonrenewable resources. Economic, political, and social benefits may accrue from the availability of oil and gas. Most benefits would be short-term and would decrease the nation's dependency on oil imports. If additional supplies were discovered and developed, the proposed production system would enhance extraction.

The production of oil and gas from the Cook Inlet/Shelikof Strait would provide short-term, critically needed energy and perhaps provide time either for the development of long-term alternative energy sources or substitutes for petroleum feedstocks. Petroleum development in these areas may mean the irreplaceable loss of some fisheries production. The maintenance and enhancement of long-term productivity will depend on efforts to control water-quality levels. Regional planning will aid in controlling changing economics and populations, and thus in moderating any adverse impacts.

Alternatives to the proposal, such as cancellation, delay, and partial deletion options reduce to varying degrees both the long- and short-term environmental effects, as well as the long- and short-term energy supply benefits, as explained in the preceeding impact sections.

C. Irreversible and Irretrievable Commitment of Resources:

1. Mineral Resources: The mean resource estimates of the proposed action are 670 MMbbls of oil and 1.173 tcf of natural gas. Should these resources be discovered, they will be irretrievably consumed.

2. Biological Resources: Commercial fishery losses may occur in several ways as discussed in section IV.A.2.b. and c. (Impacts on Commercial Fish and Commercial Fishing). For example, if the nearshore areas are contaminated salmon and herring may avoid the areas which are also the areas in which they are harvested. If fish tissue of any species becomes tainted, there may be a widespread consumer avoidance of all locally harvested fish products, which would affect both fishermen and processors alike. Any losses of commercial fishing incomes attributable to this proposal would be irreversible and irretrievable. Unharvested commercial finfish and shellfish, as renewable resources, would be irretrievably lost to the economy.

If there is competition for harbor space or employees as a result of leasing, U.S. fishermen may not aggressively exploit the U.S. offshore bottomfishery potentials. Continued harvest of bottomfish by foreigners means irretrievably lost income to U.S. fishermen and processors.

General industry activities, such as increased ship traffic, aircraft noise, and land based activities, could displace marine and terrestrial birds and

mammals into less favorable environments, which would eventually result in reduced population levels. This displacement could become irretrievable if permanent alterations to the environment and habitat were maintained by man.

3. Endangered Species: Under the proposal, it is possible that endangered whales would be subjected irreversibly to the direct and indirect effects of oilspills, disturbance due to noise and other human activities, or losses and/or deterioration of habitat due to facility developments. Whether such effects would lead to permanent (irreversible) losses of whale resources is unknown (see sec. IV.A.2.f., Unavoidable Adverse Effects Resulting from the Proposal).

4. Social Factors: Irreversible and irretrievable lifestyle elements could be lost if Kodiak Island and Cook Inlet villages are changed without consideration by industry of their traditional values and social interrelationships. These aspects of village life have evolved over centuries of living a subsistence-oriented lifestyle which could be affected through external economic stimulus. Irretrievable loss of customary and traditional renewable resources could significantly damage the social and economic fabric of village life. The city of Port Lions may lose its close-knit, small fishing community quality and sociocultural character if consideration is not given to the impact of people from large metropolitan and industrial communities. An irretrievable loss of lifestyle and quality of life also may be experienced in Kodiak and Homer, larger communities capable of a higher degree of adaptation but which maintain aspects of village lifestyle.

5. Visual and Wilderness Resources: With the proposal, there would be an irreversible commitment of wilderness and scenic resource areas in certain coastal locations of the Kodiak Archipelago and Kenai Peninsula.

D. Worst Case Analysis:

1. Endangered Species: This section is in response to Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22) which require a worst case analysis for certain decision problems. Information pertaining to endangered whales is important, but to develop an ability to predict (with reasonable statistical confidence) the behavioral responses of a relatively common endangered whale species to all sources of noise associated with petroleum exploration, development, and production would require extensive field experiments for which it is uncertain (and unlikely) that control of all relevant variables could be achieved. To achieve ability to predict behavioral response patterns of very rare whale species (such as the right whale, which has not been sighted in recent years) through experimental or purely descriptive approaches is impossible given the present state of the art and probably will remain so for the foreseeable future. The same rationale could be applied with equal validity to describe the difficulty of predicting direct physiological response of endangered whales to effects of oilspills. Therefore, for the Bureau of Land Management to proceed with the proposed action (or other alternatives) in the face of uncertainty, a worst case analysis is appropriate and, as required, an indication of probability of the occurrence of such a worst case necessary. This analysis is performed for endangered cetaceans only. Sufficient information exists to predict with confidence that the proposed sale will have little, if any, detrimental effects on endangered birds.

The worst case analysis for endangered whales draws from certain subjective judgments and assumptions regarding whale responses for which the validity has not been statistically tested or verified. It also is based on assumptions regarding exploration, development, and production activities of petroleum resources in the proposed sale area (sec. IV.A.1.). As indicated by the oilspill risk analysis, should spills occur, they would be confined to the lower Cook Inlet and Shelikof Strait area. Therefore, portions of this analysis will be confined primarily to oilspill effects which would be generally restricted to this area. Also, based on existing information (sec. III.B.5.) and graphic 12), it is highly unlikely that sperm or blue whale populations or individuals make significant use of lower Cook Inlet or Shelikof Strait. On the other hand, recent sightings of gray, fin, humpback, and sei whales in or near the proposed sale 60 area mandate that these species be considered in a worst case analysis. The right whale also is considered in this analysis since historical records indicate a previous, although not recently confirmed, utilization of waters east of Kodiak Island. In addition, there is not sufficient knowledge of the present status of the right whale to positively exclude the possibility that a critical portion of the remaining right whale population may occasionally frequent the proposed sale area.

Table IV.D.-1 shows a list of assumptions referenced for the purpose of this analysis. The probability of the assumptions being correct are also indicated. Since the whale species considered herein are similar to the extent that all are baleen whales, they are treated in general unless otherwise specified. Table IV.D.-2 presents assumptions regarding exploration, development, and production effects hypothesized for this analysis.

No clear definition of a "worst case" exists and, therefore, at least two approaches can be employed to make such an analysis. One approach would be to speculate on the most likely undesirable consequences given a set of postulates (i.e., an answer to the question, "What are the most likely undesirable consequences that will happen given certain conditions?"). The second approach would be to assign a probability of occurrence to a specifically defined consequence (i.e., an answer to the question, "What is a probability of a specifically defined 'worst case'?"). Both approaches are employed herein.

Most Likely Undesirable Consequences

Table IV.D.-1. and IV.D.-2 consist of a set of postulates which can be used to speculate on the most probable undesirable consequences of the proposed sale. Table IV.D.-2 shows that there is a moderate to high chance that exploration activities will occur, and; given such activities, a low probability that development phases will be achieved. Nevertheless, this analysis will assume the occurrence of exploration, development, and production of the proposed sale, and speculate on the most likely undesirable consequences regarding endangered whales that may occur for each phase. Refer to section IV.A.2.f. for a description of possible direct and indirect effects of various perturbations which may impact whales, and sections IV.A.1.a. through IV.A.1.c. for detailed assumptions regarding each phase of the proposed sale.

Exploration: The most likely of potential undesirable outcomes which would occur as a result of direct effects of exploration activities would be temporary disturbance on localized basis of whales which may feed or migrate in or near exploration platforms or transportation routes used to access plat-

Table IV.D.-1
Assumptions Made Regarding
Endangered Whale Status and Response

	Assumption	Probability of Assumption Being Correct[1/]
1.	Although listed in the endangered species, the gray whale population is close to pre-whaling stock size and may be near the capacity of its range.	High
2.	Humpback, fin, sei, and right whales population are substantially below pre-whaling stock size.	High
3.	Gray, humpback, fin, and sei whales are found in or near the proposed sale area during spring, summer, and fall.	High
4.	Right whales occur in or near the proposed sale at least during the summer.	Unknown
5.	Fouling of baleen by crude oil could temporarily reduce whale feeding efficiency.	Moderate
6.	Localized food sources of endangered whales could be reduced, at least temporarily, by toxic hydrocarbons.	Low-Moderate
7.	Endangered whale behavior in the presence of spilled hydrocarbons would permit contact with such pollutants.	Moderate
8.	Direct cutaneous contact with or inhalation of volatile compounds associated with crude oil or other spilled hydrocarbons could affect whales at least temporarily.	Moderate
9.	Direct cutaneous contact with or inhalation of volatile compounds associated with crude oil or other spilled hydrocarbons could kill endangered whales directly.	Unknown
10.	Long-term use of oil-polluted areas would lead to tissue accumulation of toxic substances and deleterious effects on endangered whales.	Unknown
11.	Endangered whales are or will be sensitive to drilling noise or other sources of disturbance associated with oil and gas exploration, development, and production phases.	Unknown

[1/] Low: Less than a 50 percent chance of assumption being correct. Moderate: 50 percent chance of assumption being correct. High: Greater than a 50 percent chance of assumption being correct.

Table IV.D.-2
Postulate for Level of Perturbations Associated with the
Proposed Sale 60 Which May Affect Endangered Whales

	Assumption	Probability of Assumptions Being Correct[1/]
1.	The proposed lease sale will be held and exploration[1] of the proposed sale are will be initiated.	Moderate-High
2.	Sufficient petroleum resources are discovered to warrant development[2] of the proposed sale to production phases.[3]	Low[5] (5%)
3.	If production phases are realized, at least 4 spills greater than 1,000 Bbl will occur over the life of the field.	High[6] (98%)
4.	If exploration or production phases are realized at least one catastrophic spill consisting of a blowout of 2,000 Bbl per day for 30 days will occur.	Low
5.	If spills occur, at least one or all the spills will escape containment and thus spill behavior will be controlled strictly by natural influences such as winds, currents, and tides.	Moderate-High

1/, 2/, and 3/ See section IV.A.1. for additional assumptions regarding causes of possible impacts.

4/ Low: Less than a 50 percent chance of assumption being correct. Moderate: 50 percent chance of assumption being correct. High: Greater than a 50 percent chance of assumption being correct.

5/ See section II.A.

6/ Appendix D.

forms. In consideration of the relatively small number of platforms, and already substantial boat traffic in lower Cook Inlet and Shelikof Strait, it seems unreasonable to envision disturbance due to exploration activities as being of major additional consequence to endangered whale populations. In the event of marine pollution, (e.g., oilspills, drilling mud and cutting disposal, other wastes) during exploration, the entire range of direct and indirect effects discussed in section IV.A.2.f. of such pollution may occur and the magnitude of such effects may be in direct proportion to the magnitude of the pollution and/or the number of whales present and potentially affected by it. Numbers of whales affected will vary in terms of seasonal use patterns (e.g., relatively little direct effects in winter for all species, but perhaps more during spring, summer, and fall) and population responses may vary proportionate to the fraction of any particular population present. It would be very unlikely that the amount of drilling muds and cuttings disposed at sea during exploration would significantly impact cetaceans given the small amount and probable extreme dilutions that would be achieved by any toxic fraction. Therefore, since lower Cook Inlet and Shelikof Strait are not presently known to be areas of major importance to any endangered whale species (see section IV.B.5.), it is unlikely that the exploration phase would result in major undesirable responses (e.g., increased mortality rate, decreased productivity, habitat abandonment) of endangered cetaceans. This conclusion was also reached by National Marine Fisheries Service in consultation with the Bureau of Land Management (appendix H).

Development: The most likely of potential undesirable consequences affecting endangered whales during development would be effects of disturbance since the maximum potential for disturbance of endangered whales would probably occur during this phase. Such disturbance could result in at least temporary and possibly long term abandonment of habitats in the vicinity of platforms, pipelines, or facility construction nearshore. Drilling noise during the development phase, vessel noise, noise of construction, etc., could all affect whales during the 5-year development period. Temporary response of whales to peak transportation activity between shore and offshore support/supply bases or platforms may occur. Such temporary or development phase effects would not be expected to be particularly pronounced for gray whales since there is evidence that they are relatively tolerant of human activity. Whether any other endangered population is particularly sensitive to such disturbance and would be adversely affected during the development phase is unknown.

In the event of marine pollution (e.g., oilspills, drilling mud and cuttings disposal, other wastes) during development, the entire range of direct and indirect effects discussed in section IV.A.2.f. may occur, and the magnitude of such effects may be in direct proportion to the magnitude of the pollution and number of whales present and potentially affected. Probably of most significance would be cetacean habitat alteration associated with drill cutting disposal. This may cause temporary reduction of benthic organisms utilized by gray whales, but since most of the gray whale population feeds at more northern latitudes, no major impact on this species would be expected. It is unlikely that the physical presence of cuttings would affect other endangered whale species. It is unknown whether toxic substances introduced into the marine environment as a result of development would affect whales. However, since lower Cook Inlet and Shelikof Strait are not presently known to be areas of major importance to any endangered whale species (sec. III.B.5.), it is unlikely that the development phase would result in major undesirable population

responses of endangered cetaceans. As mentioned above, temporary or long term abandonment by endangered cetaceans of certain locales, such as near platforms or transportation facilities, could occur.

Production Phases: One of the most likely of potential undesirable consequences of production phases would be effects on whales associated with repeated or chronic introduction of pollutants into the marine environment. Refer to sections IV.A.2.f. through IV.A.7.f. for detailed analysis of potential oilspill-related effects on endangered cetaceans as may be associated with the proposal or its alternatives. In the event of marine pollution (e.g., oilspills, drilling mud and cuttings disposal, other wastes) during production, the entire range of direct and indirect effects discussed in section IV.A.2.f. may occur in direct proportion to the magnitude of the pollution and number of whales present and potentially affected by it. Therefore, since so little is known about the specific mechanisms or magnitude of the response of the whales to various direct or indirect effects to oilspills or other marine pollution, no quantitative assessment of potential endangered whale population response can be made at this time. However, such effects are possible. As concluded previously, spills occurring over the production life of the field would be highly likely in the vicinity of the northern Kodiak Archipelago, Kamishak Bay, and eastern Shelikof Strait. These risks could possibly lead to lowered carrying capacity of these areas for endangered whales or possibly to long term ingestion and accumulation of toxic substances encountered in such areas. Also to be associated with production phases would be disturbance and spill effects associated with tankering and petroleum products. Movement of tankers though Stevenson or Kennedy Entrance may not result in risks of oilspills above those already existing but movement of tankers from a location on eastern Kodiak Island over the Portlock Banks could expose what are probably important cetacean feeding areas to risks not presently existing. Portlock Bank areas east of Kodiak Island are probably more significant than areas inside lower Cook Inlet and Shelikof Strait in terms of whale use and potential food availability to whales. Travel of tankers throughout the range of various species may affect whales over a larger region than those activities on the sale area proper. However, it is difficult, if not impossible, at this time to evaluate potential effects of pollution or disturbance due to the proposed sale or to compare such effects to those already sustained from other sources.

Since most construction and development drilling would have been completed prior to this phase, disturbance effects due to drilling, if existant, would be of lesser significance than during the development phase.

Probability of Defined Worst Case

Two major "worst case" situations are postulated and the probabilty of such "worst cases" estimated. These cases were selected because it was the viewpoint of Bureau of Land Management that whale mortality or habitat loss may be the two consequences of the proposed project which could be causally or directly linked to any observable population response in endangered cetaceans, and which may be of most significance of all possible consequences.

Mortality of a Critical Number: An event which would be a major concern in terms of a threat to the survival of an endangered cetacean species and, therefore, one which would be considered a "worst case" would be one which caused direct mortality of a critical number of animals. A "critical number"

could be considered an amount of mortality beyond that which the population could recover. Such an event could, therefore, be implicated as a proximal cause of the extinction of a species and reasonably be classified as a "worst case" event. Table IV.D.-1 shows that the probabilities of an individual whale being killed as a result of direct contact with spilled oil is "unknown" (table IV.D.-1). However, if it is assumed that 1) this latter probability is high, 2) a major portion or critical number of an endangered whale population is present at the time of spill occurrence in the area of occurrence, and 3) that assumption 2 or 4 (table IV.D.-2) are low, then it must be concluded that the joint probability of (1), (2), and (3) above is also low, even if (2) or (3) would be of high probability. Therefore, it is unlikely that the proposed lease sale would cause a "worst case" threat to endangered whale populations as a result of direct mortality.

Abandonment of Habitat: Another "worst case" situation which could be envisioned for endangered whales would be the possibility of the exclusion of these species from previous habitats as a direct result of noise and other disturbance. As shown in table IV.D.-1 (assumption 8), it is unknown if the various endangered whale species under consideration are sensitive to disturbance associated with oil and gas development and production. In general, each species and each potential source of disturbance would have to be studied on a case-by-case basis before accurate sensitivity assessments could be made. However, if we 1) assume that these species are sensitive to most oil and gas related disturbance, and 2) assume that the probability of development and production of the field is as shown in table IV.D.-2, assumptions 1 and 2, then it appears that the probability of any long term effect of noise and other disturbance due to the proposed sale would be the joint probability of (1) and (2); i.e., of low to moderate probability at most. If oil and gas is discovered, then the probability of disturbance effects on whales may be higher, particularly on a local level and for species such as the humpback which may be sensitive to certain types of disturbance. The probability of such sensitivity leading to an undesirable population response is unknown and would vary on a species-by-species basis.

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  - National Oceanic and Atmospheric Administration
- Department of Defense
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- Department of the Interior
  - Bureau of Land Management
    - Division of Alaska Native Claims Settlement Act Operations
    - Outer Continental Shelf Office-Los Angeles
  - Fish and Wildlife Service-Anchorage, Kodiak, and Kenai
  - Geological Survey
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    - Geological Division
    - Water Resources Division
  - National Park Service
- Department of Transportation
  - Coast Guard
- Environmental Protection Agency

State:

- Department of Commerce and Economic Development
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APPENDIX A

PETROLEUM DEVELOPMENT SCENARIOS AND BASIC ASSUMPTIONS UTILIZED TO DEVELOP THE ALTERNATIVES INCLUDING THE PROPOSAL

Introduction

The following pages present oil and gas development scenarios which describe the proposal, as well as the three alternatives to the proposal. These scenarios form the basis for the following sections: Description of the Alternatives Including the Proposal (secs. II.A. and II.B.), Basic Assumptions Regarding Causes of Possible Impacts Resulting From the Alternatives Including the Proposal (sec. IV.A.I), and Estimation of Direct Employment and Description of Basic Assumptions Utilized (Appendix B).

The mean case of the proposed action is the focus of an environmental analysis throughout this environmental impact statement. For this reason, a description of the mean case will not appear in this appendix. Tables indicating time periods for facility investment and construction will be displayed for all cases.

Exploration Field Development and Production Assumptions: The following exploration and production assumptions were used in constructing the five scenarios portrayed in this EIS. These assumptions are generalized and have application to all scenarios heretofore discussed.

In order for development to be economically feasible, the 95 percent resource level should be discovered in at least one or two fields.

Drilling would occur year-round.

Exploratory drilling would require heavy duty semisubmersibles; however, jack-ups could be used in selected locations. Drillships would probably not be used due to their inability to maintain their location during the violent storms Cook Inlet and Shelikof Strait experience.

Each exploratory well is assumed to require an average of 180 days to complete.

The average vertical depth of an exploratory well will be 16,000 feet. For production wells the average depth will be 10,000 feet.

Marine support activities for the exploratory phase of OCS activity would be launched initially from existing facilities at Nikiski, and future facilities at Homer. No marine support activities are seen to come from Chiniak Bay.

Air support for lease sale 60 would primarily issue from airfields near the marine support facilities. Some air support during the exploratory phase and most definitely during the developmental phase, would issue from the Port Lions airfield.

The existing industrial infrastructure at Nikiski (excluding Homer) is adequate to support all future sale 60 support activities.

Well workovers may begin in the fifth year of each wells' operation, and proceed on a four- or five-year cycle after that. One workover rig per platform would do the work.

One service well for every four production wells will be drilled.

One rig per production platform (though not necessarily the same rig) would accomplish all production-related drilling.

The type of production platform which would be emplaced in the Cook Inlet/ Shelikof Strait lease area would be determined on site-specific criteria. Several platform types could be employed: guyed tower, catenary, and tension-leg. However, the type of platform most probably used will be a pile-driven steel tower engineered for the rigorous requirements of the sale area. The platforms would be built on the U.S. west coast or in Japan, and would be towed to the drill site. Platform crews for operation onboard at any one time would peak at:

Minimum Case	100 persons
Mean Case	170 persons
Maximum Case	222 persons

Offshore production facilities inadequate for the sale area are subsea completions, gravel islands, and steel and/or concrete gravity structures.

No platforms would be strictly utilized for pipeline systems.

Oil production for the northern portion of the sale area would be pipelined directly to an oil storage facility located in the Anchor Point/Stariski Creek area. Oil from the Shelikof Strait would be pipelined through the Kupreanof Straits to Chernof Point, and then overland to an oil storage terminal located near Talnik Point. The size of these terminals would range from 120-170 acres each.

*Due to the climate of the Kizhuyak-Marmot Bay area, the Talnik Point facility would probably require a breakwater.

All gas production would be pipelined to Anchor Point and the overland to an existing LNG facility located at Nikiski.

Storage facilities at all terminals would equal five to ten days of production; most probably six days.

Gas production would probably be treated on the platforms and pipelined to shore. Any gas condensates will probably be reinjected into the formation.

All gas produced is assumed to be associated gas.

There would be no onshore oil booster stations. There may be one 40 acre gas compressor station located in the Stariski Creek/Anchor Point area.

Oil pipeline diameters will range from 18 to 26 inches, with 22 inch used in the mean case. Gas pipeline will range from 10 to 26 inches with 18 inch used in the mean case.

No offshore pipeline laying problems are anticipated. Pipeline burial disturbance would equal between 4,000 and 6,000 yds.^{3} with 5,000 yds.^{3} judged to be applicable for the mean case.

The price of the produced LNG delivered to California would, in the mean case, amount to approximately $5-$7 per Mcf. This figure represents approximately $2-$3 for the cost of production and $3-$4 for the cost of shipment.

The wellhead price for oil (given world conditions at the time of preparation of this draft) would equal $25-$30 per barrel. The price delivered to the west coast of the United States would run some $28-$32 per barrel.

Supply boats and helicopters would move supplies and personnel between shore and platforms. The combined air and water fleet would range between 3-4 units per platform. The fleet size is dependent on the phase of OCS activity. During a later period of production, the fleet size may decrease to one to two units for every two platforms.

Onshore pipeline, on the Kenai Peninsula and on Kodiak could be laid at 2 miles per day.

Offshore barges vary in their ability to lay pipeline. Depending on climate and length of the laying season a barge can emplace 50-75 miles of pipe in a season.

Standard pipe lay barges can operate in wave heights up to 5 feet. As the weather throughout the proposed sale area is generally inclement, it is probable that larger lay barges, such as the "Viking Piper," will be used in order to minimize downtime.

Exploration wells (16,000 ft depth) would require up to 1,050 tons of crushed rock material to be used for drilling mud. Of that tonnage, at least 825 tons would be barite. Exploratory wells would also require up to 525 tons of cement and produce approximately 375 yds.^{3} of drill cuttings.

Production wells (10,000 ft depth) would require up to 750 tons of crushed rock material to be used for drilling mud. Of that tonnage, at least 600 tons would be barite. Production wells would also require up to 370 tons of cement and produce approximately 270 yds.^{3} of drill cuttings.

As the nature of the geological formations of the Shelikof Strait area is only partially known, it is difficult to estimate the amount of formation water which may be contained in the hydrocarbon reservoirs. Figures gleaned from the production statistics of the upper Cook Inlet oilfield indicate that as of 1978 one barrel of formation water was being produced for every two barrels of oil.

Estimated Activity Based on the 95 Percent (Minimum) Scenario: Exploration is expected to begin in 1982 and continue through 1986 with a total 11 exploration and delineation wells drilled. No more than two drill rigs are assumed to be working during any year. Jack-up rigs could be used in favored locations; however, given the area's strong currents and deep water, semisubmersibles would be employed in most cases.

If initiated, the development phase would begin in 1985 with the installation of a pile-driven steel tower platform. In 1986, the second of the two platforms forecast for this scenario, would be emplaced. By 1989, some 96 production and service wells would be drilled. Full production would begin in 1986 with a peak production of 55.3 MMbbls of oil and 96.8 Bcf of gas occurring in 1990.

Pipeline construction would begin in 1985 and continue through 1988. A total of 230 miles of gas and oil pipe would be emplaced by either a reel or lay barge. See table A-6 for a breakdown.

Oil and gas production is expected to begin in 1987 with oil production ceasing in 2009 and gas in 2010. The total life of the field is expected to be 23 years.

Pipeline diameters utilized for oil transport would be 18 inches for oil and 10 inches for gas.

The facility construction scenario for the minimum case closely parallels that which was outlined for Alternative V. The minimum case scenario stipulates the location of a small hydrocarbon reservoir in the lower Cook Inlet.

Approximately 160 miles of offshore oil and gas pipe would be constructed to a landfall located between Stariski Creek and Anchor Point. At the landfall, an oil storage terminal would be constructed. The terminal would be approximately 120-140 acres in size, and would contain: loading facilities for tankers of the 100,000 dwt class, ballast water treatment facilities, reservoir tanks, and a small gas compressor station. Oil storage tanks should have a total capacity of between 400,000 and 600,000 barrels of oil.

From the oil storage/transportation facility, natural gas would be piped 70 miles overland (along the coast) to the Kenai/Nikiski area. At that point the gas would be liquefied at either the existing Phillips LNG plant or the proposed Pacific LNG facility. From Nikiski, the gas would be shipped via LNG tankers to the west coast of the United States or Japan.

Marine support activities would be launched from the Kenai/Nikiski area. Existing dock facilities are such that no expansion would be necessary to undertake the volume of activity forecast in the minimum case scenario.

Air support would issue from both the Kenai/Nikiski area as well as the Port Lions airfield.

Due to the development of the upper Cook Inlet and the exploratory activity required by sale CI, many oil companies (Marathon, AMOCO, Union, ARCO) have constructed supply yards and warehouses in the Kenai area. Unless a company, thus far foreign to the Cook Inlet, is involved in a hydrocarbon strike, it is doubtful that any major addition to existing supply facilities will occur.

Estimated Activity Based Upon the 5 Percent (Maximum) Scenario: Exploration is expected to begin in 1982 and continue through 1987 with a total of 28 exploration and delineation wells drilled. A maximum of four drill rigs would

be operational during the peak year of exploratory activity (1984). Jack-up rigs could be used in shallow water; however, semisubmersibles are preferable throughout most of the sale area.

If initiated, the development phase would begin in 1985 with the installment of three pile-driven (supported) steel tower platforms. In 1987, the seventh and last of the platforms would be installed. By 1992, some 295 production and service wells would be drilled. Production would begin in 1987 with a peak production of 124.9 million barrels of oil and 218.6 Bcf of gas occurring in 1993.

Oil and gas production is estimated to begin in 1987 with oil production ceasing in 2013 and gas ceasing in 2014. Total life of the field is expected to be 27 years.

Pipeline construction would begin in 1984 and continue through 1987. A total of 435 miles of gas and oil pipe would be emplaced by either a reel or lay barge. See table A-7 for a further discussion.

Standard pipe lay barges can operate in wave heights up to 5 feet. As the weather throughout the proposed sale area is generally inclement, it is probable that larger lay barges, such as the "Viking Piper," will be used in order to minimize downtime.

Pipeline diameters utilized for hydrocarbon transport would be 26 inches for both oil and gas pipe.

The facility construction scenario for the maximum case stipulates the location of large oil and gas reservoirs in both the Cook Inlet and the Shelikof Strait. Two oil terminals would constructed. One would be located in the Stariski Creek/Anchor Point area and the other near Talnik Point on the shores of Marmot Bay.

The oil terminals would occupy about 100 acres each, with the Anchor Point terminal having an additional 40 acres for a gas compressor station. The terminal would contain loading docks (for tankers of the 100,000 dwt class), ballast water treatment facilities, and reservoir tanks. The tanks at each terminal should have the capacity to store up to 900 Mbbls of oil.

The oil pipeline which would be constructed to the Anchor Point facility would pass entirely underwater. The oil pipeline to Talnik Point would pass through the Kupreanof Straits from Shelikof to a landfall at Chernof Point. From the landfall it would reach overland some ten miles to the Talnik Point oil terminal. All gas produced within the Cook Inlet and the Shelikof Strait would be piped to Anchor Point. Once reaching shore at Anchor Point, the gas pipe would travel overland to the LNG plant(s) located at Nikiski.

Gas and oil resources would be split evenly between the facilities located on the Kenai Peninsula and those located on Kodiak. Each group would receive 500 MMbbls of oil and 900 Bcf of gas over the life of the field.

Marine support for all phases of OCS activity would be launched from the Kenai/Nikiski area. Existing Nikiski dock facilities would be adequate during the production phase of OCS activities; however, some expansion would be necessary to meet logistics requirements during the exploratory drilling stage.

Air support would issue from both the Kenai/Nikiski area as well as Port Lions on Kodiak Island.

Due to the development of the upper Cook Inlet and the exploratory activity required by sale CI, many oil companies (Marathon, Union, AMOCO, ARCO, etc.) have constructed supply yards and warehouses in the Kenai area. The full import of the maximum development scenario may cause some expansion (amount unknown) to existing supply facilities within the Kenai area. However, unless a company, thus far foreign to the Cook Inlet is involved in a hydrocarbon strike, it is doubtful that any major addition to existing supply facilities will occur.

Table A-1
Lower Cook Inlet/Shelikof Strait
95 Percent Scenario (Minimum Case)
Estimated Development Scenario and Schedule of Investment and Production

Year	Exploration and Delination Wells No.	Cost[2]	Rigs	Platforms and Equipment No.	Cost[3]	Production and Service Wells No.[4]	Cost[5]	Rigs	Workover Wells[6] No.	Rigs	Onshore Supply Support Facilities No.[7]	Cost[8]	Trunk Pipelines Miles	Cost[9]	Terminals No.[10]	Cost[11]	Total Investment	Operating Cost	Oil MMbbls	Gas Bcf
1981	Sale-September 1981																			
1982	1	10.9	1								2	22.4								
1983	3[1]	32.7	2														33.3	0.2		
1984	4[1]	43.6	2														32.7	0.2		
1985	2	21.8	2	1	302.7												43.6	0.2		
1986	1	10.9	1	1	302.7	16	59.2	2					135	373			697.5	0.2		
1987						24	88.8	2					65	179	1	302.7	854.5	0.2		
1988						28	103.6	2					30	83			171.8	6.7	7.6	13.3
1989						28	103.6	2									103.6	24.6	28.0	49.0
1990																	103.6	43.4	48.8	85.3
1991									18	2								50.2	55.3	96.8
1992									18	2								44.3	47.3	82.8
1993									18	2								35.2	35.8	62.5
1994									18	2								28.2	27.0	47.2
1995									18	2								23.0	20.4	35.7
1996									18	2								19.1	15.4	27.0
1997									18	2								16.1	11.7	20.4
1998									18	2								13.8	8.8	15.4
1999									18	2								12.1	6.7	11.7
2000									18	2								10.8	5.0	8.8
2001									18	2								9.9	3.8	6.7
2002									18	2								9.1	2.9	5.0
2003									18	2								8.6	2.2	3.8
2004									18	2								8.2	1.6	2.9
2005									18	2								7.8	1.2	2.2
2006									18	2								7.6	0.9	1.6
2007									15	2								7.4	0.7	1.2
2008									13	2								6.6	0.5	0.9
2009									10	2								4.6	0.3	0.5
2010																		2.2	0.1	0.2
																		0.5	-0-	0.1
Total	11	119.9	2	605.4	96	355.2			308		22.4	230	635	1	302.7	2,040.6	401.0	332.0	581.0	
Average Annual Production																		14.4	24.2	
Peak Production (Mbbls/d and MMcf/d)																		151.5	265.2	

All costs are "as installed" in millions of 1979 dollars.
Source: USDI 1979a; Alaska OCS Office, 1979;

Note: Footnotes for all tables are listed on separate sheets at end of all tables.

Table A-2
Lower Cook Inlet/Shelikof Strait
Mean Scenario (Alternative 1)
Estimated Development Scenario and Schedule of Investment and Production

Year	Exploration and Delination Wells No.	Cost[2]	Rigs	Platforms and Equipment No.	Cost[3]	Production and Service Wells No.[4]	Cost[5]	Rigs	Workover Wells[6] No.	Rigs	Onshore Supply Support Facilities No.[7]	Cost[8]	Trunk Pipelines Miles	Cost[9]	Terminals No.[10]	Cost[11]	Total Investment	Operating Cost	Oil MMbbls	Gas Bcf
1981	Sale-September 1981																			
1982	3	31.2	2								2	22.4					53.6	0.2		
1983	4[1]	41.6	3														41.6	0.2		
1984	4[1]	41.6	3														41.6	0.2		
1985	3	31.2	2	1	302.7								145	545			878.9	0.2		
1986	2	20.8	1	2	605.4	26	96.2	2					190	714.2	2	605.4	2014.8	0.2		
1987				1	302.7	42	155.4	4					65	245			703.3	6.6	7.6	13.3
1988						42	155.4	4									155.4	24.7	28.1	49.1
1989						42	155.4	4									155.4	50.4	56.6	99.1
1990						42	155.4	4									155.4	75.4	83.9	146.8
1991						1	3.7	1	35	4							3.7	88.5	96.8	169.5
1992									35	4								86.3	91.9	160.9
1993									35	4								73.4	75.1	131.4
1994									35	4								58.9	56.8	99.4
1995									35	4								47.9	42.9	75.1
1996									35	4								39.6	32.4	56.8
1997									35	4								33.4	24.5	42.9
1998									35	4								28.6	18.5	32.5
1999									35	4								25.0	14.0	24.5
2000									35	4								22.3	10.6	18.5
2001									35	4								20.3	8.0	14.0
2002									35	4								18.7	6.1	10.6
2003									35	4								17.5	4.6	8.0
2004									35	4								16.6	3.5	6.1
2005									35	4								16.0	2.6	4.6
2006									30	4								15.5	2.0	3.5
2007									25	4								14.4	1.5	2.6
2008									20	4								12.2	1.0	1.8
2009									12	3								8.9	0.6	1.1
2010									12	2								5.2	0.3	0.6
2011																		2.2	0.1	0.2
2012																		0.5	-0-	0.1
Total	16	166.4	4	1,210.8	195	721.5			624	2	22.4	400	1,504	2	605.4	4,230.5	810.0	670.0	1173.0	
													Average Annual Production					26.8	45.1	
													Peak Production (Mbbls/d and MMcf/d)					265.2	464.4	

All costs are "as installed" in millions of 1979 dollars.
Source: USDI 1979a; Alaska OCS Office, 1979;

Table A-3
Lower Cook Inlet/Shelikof Strait
5 Percent Scenario (Maximum Case)
Estimated Development Scenario and Schedule of Investment and Production

Year	Exploration and Delination Wells No.	Cost[2]	Rigs	Platforms and Equipment No.	Cost[3]	Production and Service Wells No.[4]	Cost[5]	Rigs	Workover Wells[6] No.	Rigs	Onshore Supply Facilities Support No.[7]	Cost[8]	Trunk Pipelines Miles	Cost[9]	Terminals No.[10]	Cost[11]	Total Investment	Operating Cost	Oil MMbbls	Gas Bcf
1981	Sale-September 1981																			
1982	4	37.6	2								2	22.4					60.0	0.3		
1983	6[1]	56.4	3														56.4	0.3		
1984	9[1]	84.6	4														84.6	0.3		
1985	6[1]	56.4	3	3	908.1								165	620			1584.5	0.3		
1986	2	18.8	2	2	605.4	32	118.4	3					215	808.2	2	605.4	2158.4	0.3		
1987	1	9.4	1	1	302.7	60	222.0	5					20	76.			610.3	6.6	7.6	13.3
1988						60	222.0	6									222.0	24.7	28.1	49.2
1989						60	222.0	6									222.0	50.7	57.1	99.9
1990						53	196.1	5									196.1	76.1	84.8	148.3
1991						16	59.2	2	53	6							59.2	95.9	105.3	184.3
1992						14	51.8	2	53	6							51.8	111.6	120.7	211.3
1993									53	6								117.8	124.9	218.6
1994									53	6								110.6	113.7	199.0
1995									53	6								93.9	92.0	160.9
1996									53	6								76.1	69.5	121.6
1997									53	6								62.6	52.5	91.9
1998									53	6								52.4	39.7	69.4
1999									53	6								44.8	30.0	52.5
2000									53	6								39.0	22.7	39.6
2001									53	6								34.6	17.1	30.0
2002									53	6								31.3	13.0	22.7
2003									53	6								28.8	9.8	17.1
2004									53	6								26.9	7.4	13.0
2005									53	6								25.5	5.6	9.8
2006									53	6								24.4	4.2	7.4
2007									45	6								22.9	3.2	5.5
2008									37	6								20.4	2.3	4.0
2009									30	6								16.8	1.6	2.8
2010									15	6								12.9	1.1	1.9
2011									10	4								9.0	0.7	1.1
2012									8	3								5.3	0.3	0.6
									4	2										

[1] Includes delineation wells.
[2] Cost in millions of dollars.
[3] Cost in millions of dollars.
[4] Number of wells drilled.
[5] Cost in millions of dollars.
[6] Number of wells drilled.
[7] Number of facilities.
[8] Cost in millions of dollars.
[9] Cost in millions of dollars.
[10] Number of facilities.
[11] Cost in millions of dollars.

CONTINUED

Table A-3--CONTINUED
Lower Cook Inlet/Shelikof Strait
5 Percent Scenario (Maximum Case)
Estimated Development Scenario and Schedule of Investment and Production

Year	Exploration and Delination Wells No.	Cost[2/]	Rigs	Platforms and Equipment No.	Cost[3/]	Production and Service Wells No.[4/]	Cost[5/]	Rigs	Workover Wells[6/] No.	Rigs	Onshore Support No.[7/]	Supply Facilities Cost[8/]	Trunk Pipelines Miles	Cost[9/]	Terminals No.[10/]	Cost[11/]	Total Investment	Operating Cost	Oil MMbbls	Gas Bcf
2013																		2.3	0.1	0.2
2014																		0.6	-0-	0.1
Total	28	263.2		6	1,816.2	295	1,091.5		944		2	22.4	400	1,504	2	605.4	5,407.7	1226.0	1015.0	1776.0
												Average Annual Production							37.6	63.4
												Peak Production (Mbbls/d and MMcf/d)							342.2	598.9

All costs are "as installed" in millions of 1979 dollars.
Source: USDI 1979a; Alaska OCS Office, 1979;

Table A-4
Lower Cook Inlet/Shelikof Strait
Alternative IV
Estimated Development Scenario and Schedule of Investment and Production

Year	Exploration and Delination Wells No.	Cost[2]	Rigs	Platforms and Equipment No.	Cost[3]	Production and Service Wells No.[4]	Cost[5]	Rigs	Workover Wells[6] No.	Rigs	Onshore Support Facilities No.[7]	Cost[8]	Trunk Pipelines Miles	Cost[9]	Terminals No.[10]	Cost[11]	Total Investment	Operating Cost	Oil MMbbls	Gas Bcf
1981	Sale-September 1981																			
1982	2	16.8	2								2	22.4					39.2	0.2		
1983	3[1]	25.2	2														25.2	0.2		
1984	3[1]	25.2	2														25.2	0.2		
1985	2	16.8	1	1	229.9								150	426			672.7	0.2		
1986				1	229.9	18	66.2	2					70	199	1	302.7	798.2	0.2		
1987						28	103.6	2					30	85			188.6	6.6	7.5	13.2
1988						28	103.6	2									103.6	24.4	27.6	48.4
1989						2	7.4	1									7.4	39.1	43.7	76.6
1990									15	2							39.9	43.0	75.4	
1991									15	2							32.4	33.9	59.5	
1992									15	2							25.8	25.7	45.0	
1993									15	2							20.8	19.4	34.1	
1994									15	2							17.1	14.7	25.7	
1995									15	2							14.2	11.1	19.5	
1996									15	2							12.1	8.4	14.7	
1997									15	2							10.5	6.3	11.1	
1998									15	2							9.2	4.8	8.4	
1999									15	2							8.3	3.6	6.4	
2000									15	2							7.6	2.7	4.8	
2001									15	2							7.1	2.1	3.6	
2002									15	2							6.7	1.6	2.8	
2003									15	2							6.4	1.2	2.1	
2004									15	2							6.2	0.9	1.6	
2005									12	2							6.0	0.7	1.2	
2006									12	2							5.8	0.5	0.9	
2007									8	2							5.1	0.3	0.6	
2008									2	1							3.1	0.2	0.3	
2009																	1.0	0.1	0.1	
2010																	0.1	-0-	-0-	
Total	10	84.0	2	459.8	76	281.2	244	2			22.4	250	710	1	302.7	1,860.1	316.5	260.0	456.0	
Average Annual Production																		11.3	19.8	
Peak Production (Mbbls/d and MMcf/d)																		119.7	209.9	

All costs are "as installed" in millions of 1979 dollars.
Source: USDI 1979a; Alaska OCS Office, 1979;

Table A-5
Lower Cook Inlet/Shelikof Strait
Alternative V
Estimated Development Scenario and Schedule of Investment and Production

Year	Exploration and Delination Wells No.	Cost[2]	Rigs	Platforms and Equipment No.	Cost[3]	Production and Service Wells No.[4]	Cost[5]	Rigs	Workover Wells[6] No.	Rigs	Onshore Support No.[7]	Supply Facilities Cost[8]	Trunk Pipelines Miles	Cost[9]	Terminals No.[10]	Cost[11]	Total Investment	Operating Cost	Oil MMbbls	Gas Bcf
1981	Sale-September 1981																			
1982	1	9.5	1								2	22.4					31.9	0.2		
1983	2[1]	19.0	2														19.0	0.2		
1984	2	19.0	2														19.0	0.2		
1985	1	9.5	1	1	190.7								135	373			573.2	0.2		
1986				1	190.7	24	88.8	2					65	179	1	201.8	660.3	0.2		
1987						24	88.8	2					30	83			171.8	6.7	7.6	13.3
1988						5	18.5	1									18.5	21.4	24.2	42.5
1989																		29.5	32.8	57.5
1990																		26.5	28.3	49.7
1991									11	2								20.8	21.4	37.6
1992									11	2								16.6	16.2	28.4
1993									11	2								13.5	12.3	21.5
1994									11	2								11.1	9.3	16.3
1995									11	2								9.3	7.0	12.3
1996									11	2								8.0	5.3	9.3
1997									11	2								6.9	4.0	7.0
1998									11	2								6.1	3.0	5.3
1999									11	2								5.6	2.3	4.0
2000									11	2								5.1	1.7	3.0
2001									11	2								4.8	1.3	2.3
2002									11	2								4.5	1.0	1.7
2003									11	2								4.3	0.7	1.3
2004									11	2								4.2	0.6	1.0
2005									7	2								4.1	0.4	0.8
2006									5	2								4.0	0.3	0.6
2007									2	1								3.3	0.2	0.4
2008																		1.6	0.1	0.2
2009																		0.3	-0-	-0-
Total	6	57.0	2	381.4		53	196.1		168	2	22.4	230	635	1	201.8	1,493.7	219.0	180.0	316.0	
											Average Annual Production							8.2	14.4	
											Peak Production (Mbbls/d and MMcf/d)							89.9	157.5	

All costs are "as installed" in millions of 1979 dollars.
Source: USDI 1979a; Alaska OCS Office, 1979;

1/ Years of exploratory well successes.
2/ Cost of exploration and delineation wells are derived on a per unit basis from GS estimates of total exploratory and expendable well investment costs divided by number of wells:

Scenario	Cost--Exploration	Cost--Expenditure	Total	# Exploratory Drilling Wells	P/Unit Cost
Minimum	74	46	190	11	10.9
Mean	98	69	167	16	10.4
Max "B"	147	116	263	28	9.4
Alt IV	49	35	84	10	8.4
Alt V	24.5	23.1	47.6	5	9.5

3/ Platform costs (from Dames & Moore, "Technical Report Number 43, Lower Cook Inlet and Shelikof Strait Petroleum Development Scenarios," Appendix B.)

All costs quoted from Dames and Moore have been indexed from 1978 to 1979 at 12.1% using the index of Finished Goods from October 1978 to October 1979, from "Economy Week" (Citibank), November 5, 1979.

All gas is associated. Platforms are assumed to be Steel Jacket.

Fabrication Costs
Water Depth
100 ft. $ 39.2 million
300 ft. $ 72.9 million
600 ft. $201.8 million

Average Water Depth (Dames & Moore, p.2):
Lower Cook 200 ft.
Shelikof Strait 600 ft.

Assume half of platforms are in Cook/Shelikof, except Alternatives IV and V where all are in Cook.

Therefore, platform fabrication costs are:
½(39.2 + 72.9)/2 and ½(201.8)=$128.9 million
for minimum, mean, and maximum and
(39.2 + 72.9)/2 $56.1 million for Alternatives IV and V

Installation Costs = $67.3 million
Includes site preparation,tow out, setdown, pile driving, module lifting, facilities hookup, etc.

Platform Equipment and Facilities
Peak Capacity (Mbbls/d)

25	53.8
25-50	67.3
50-100	106.5

4/ One service well per four production wells is assumed.

5/ Average vertical depth 10,000 ft. (GS)
Cost = $3.7 million/well (Dames & Moore)

6/ Well workovers are assumed to begin in the fifth year of each well's operation on average, and proceed on a four to five year cycle. One workover rig per platform is assumed.

7/ Existing or minimally modified supply/support facilities are assumed to be used at Nikiski (bulk cargo) and Kodiak or Cape Chiniak (air support) for exploration activity. Alternative potential marine supply/support facilities include Homer and possibly Seward. One or more of these sites or possibly a remote site within the Kodiak Island Borough is assumed to be expanded to accommodate development and production activities. On the mean and maximum scenarios, one or more of the Cook Inlet sites is assumed to be expanded to accommodate development and production activity in the northern portion of the sale area.

8/ The approximate assessed valuation of OCS related facilities currently in place at Yakutat, Cape Yakataga, and Seward was $5 million (see Eastern Gulf of Alaska, Sale 55 EIS, Footnote 3 to Tables A-1 through A-6). For this analysis the figure was doubled to accommodate production and indexed to 1979 for $11.2 million/facility.

9/ Pipeline lengths in miles (BLM/OCS):

Scenario	Oil		Gas	
	Onshore	Offshore	Onshore	Offshore
Minimum	0	80	70	80
Mean	10	160	70	160
Maximum	10	160	70	160
Mod 2	0	90	70	90
Mod 3	0	80	70	80

Pipeline Diameter (GS):
Oil--18"-26" (For the purpose of investment calculation we will assume 22" for all cases)
Gas--10"-26" (For the purpose of investment calculation we will assume 18" for all cases)

Pipeline Costs (Dames & Moore)
Marine (Includes Burial)
20"-29" $4.5 million/mile
10"-19" $3.0 million/mile
Under 10" $1.5 million/mile

Onshore
20"-29" $ .8 million/mile
10"-19" $ .5 million/mile
Under 10" $ .2 million/mile

10/ The oil terminal is assumed to be located in the Anchor Point area, though use of the existing Nikiski and Drift River facilities is possible depending upon the location of the producing fields. (On the mean and maximum scenarios, another oil terminal is assumed in the Marmot Bay area.) Natural gas in all cases is assumed to be pipelined to existing capacity in the Nikiski area (including Pacific Alaska's proposed LNG plant).

11/ Oil terminal costs (Dames & Moore):

Peak Throughput mmbbls/d	Cost
Under 100	$201.8 million
100-200	$302.7 million
200-300	$470.8 million
300-500	$605.3 million

The following functions are performed: pipeline terminal (for offshore lines), crude stabilization, LPG recovery, tanker ballast treatment, crude storage (10 days production), and tanker loading for crude trans-shipment.

12/ Please note that the development and production scenario for alternative VI will be essentially that of the minimum case.

Summary of Activities Required to Develop the
Estimated Resources Within the Proposed Action
Minimum Case
Table A-6

1. Estimated acreage, construction activity and resources:
   a. Sale Acreage Offering: 350182 hectares (864,646 acres)
   b. Exploration and Delineation Wells: 11
   c. Production Platforms: 2
   d. Production Wells: 96
   e. Workover Wells: 308
   f. Pipelines:

	Oil (18" diameter)	Gas (10" diameter)
Offshore length:	129 km (80 mi to Anchor Point)	129 km (80 mi to Anchor Point)
Onshore length:	0	113 km (70 mi to Nikiski)

   g. Terminal(s):

      Oil: 1 (Anchor Point)
      Gas: Use existing terminal at Nikiski.

   h. Recoverable Hydrocarbons:

	Oil	Gas
Total Production:	332.0 MMbbls	581.0 Bcf
Peak Production:	151.5 Mbbls/D	265.2 MMcf/D
Average Annual Production:	14.4 MMbbls	24.2 Bcf

2. Estimated peak annual transportation by tanker:
   Oil: 55.3 MMbbls
   LNG: 28 MMbbls

3. Estimated tonnage (2,000 lbs/ton) of commercial muds and volume of drill cuttings (assuming 11 exploration wells at 4864 m (16,000 ft) and 96 production wells at 3040 m (10,000 ft):

Exploration/Production

	Per Well	Total Field
Muds:	947/680 metric tons (1,044/750 tons)	10416/65280 metric tons (11,484/72,000 tons)
Cuttings:	539/206 m^3 (704/269 yd^3)	5929/19776 m^3 (7,744/25,824 yd^3)

4. Estimated volume of formation water produced:
A prediction cannot be made at this time due to incomplete knowledge of the subsea geology of the Shelikof Strait. However, based upon the behavior of the upper Cook Inlet field, we may hypothesize that at midlife the sale 60 field will be producing one barrel of formation water for every two barrels of oil.

5. Estimated land use requirements for onshore facilities:

Support/Supply:	Existing facilities in Kenai should suffice. However, a small 10 hector (25 acre) marine support facility could be constructed at Homer.	
Terminal(s) and related facilities:	Oil 1 terminal (24 hectares/60 acres)	Gas 1 compressor station (16 hectares/40 acres)

6. Estimated burial disturbance of offshore pipeline (assuming 2377 m^3/km (5,000 yd^3/mi) for oil pipeline and 1902 m^3/km (4,000 yd^3/mi) for gas pipeline) will be:

Oil: 306633 m^3 (400,000 yd^3/mi)

Gas: 245358 m^3 (320,000 yd^3/mi)

Summary of Activities Required to Develop the
Estimated Resources Within the Proposed Action
Maximum Case
Table A-7

1. Estimated acreage, construction activity and resources:
   a. Sale Acreage Offering: 350182 hectares (864,646 acres)
   b. Exploration and Delineation Wells: 28
   c. Production Platforms: 6
   d. Production Wells: 295
   e. Workover Wells: 944
   f. Pipelines:

	Oil (26" diameter)	Gas (26" diameter)
Offshore length:	129 km (80 mi to Anchor Point)	129 km (160 mi to Nikiski)
Onshore length:	129 km (80 mi to Chernof Point) 16 km (10 mi to Talnik Point)	113 km (70 mi to Nikiski)

   g. Terminal(s):

      Oil: 2 (Anchor Point and Talnik Point)
      Gas: Use existing terminals at Nikiski and Chiniak Bay (from sale 46).

   h. Recoverable Hydrocarbons:

	Oil	Gas
Total Production:	1,015.0 MMbbls	1,776.0 Bcf
Peak Production:	342.2 Mbbls/D	598.9 MMcf/D
Average Annual Production:	37.6 MMbbls	63.4 Bcf

2. Estimated peak annual transportation by tanker:
   Oil: 124.9 MMbbls
   LNG: 65 MMbbls

3. Estimated tonnage (2,000 lbs/ton) of commercial muds and volume of drill cuttings (assuming 28 exploration wells at 4864 m (16,000 ft) and 295 production wells at 3040 m (10,000 ft):

	Exploration/Production	
	Per Well	Total Field
Muds:	947/680 metric tons (1,044/750 tons)	26516/200600 metric tons (29,232/221,250 tons)
Cuttings:	539/206 m^3 (704/269 yd^3)	15092/60770 m^3 (19,712/79,355 yd^3)

4. Estimated volume of formation water produced:
A prediction cannot be made at this time due to incomplete knowledge of the subsea geology of the Shelikof Strait. However, based upon the behavior of the upper Cook Inlet field we may hypothesize that at midlife the sale 60 field will be producing one barrel of formation water for every two barrels of oil.

5. Estimated land use requirements for onshore facilities:

Support/Supply:	Existing facilities will suffice.	
Terminal(s) and related facilities:	Oil 2 terminals (69 hectares/170 acres each)	Gas 1 compressor station (16 hectares/40 acres)

6. Estimated burial disturbance of offshore pipeline (assuming 2853 m^3/km (6,000 yd^3/mi):

Oil: 368037 m^3 (480,000 yd^3) each to Anchor Point and Chernof Point

Gas: 736074 m^3 (960,000 yd^3) to Anchor Point

APPENDIX B

ESTIMATION OF DIRECT EMPLOYMENT AND DESCRIPTION OF BASIC ASSUMPTIONS UTILIZED

This section summarizes the estimated direct employment anticipated to result from the alternatives, including the proposal, as described in section I. The summary tables are included for reference purposes (tables B-1 through B-5). The development assumptions are summarized in section I, Alternatives Including Proposed Action; anticipated activities resulting from potential oil and gas development are described in section IV.A.1., Basic Assumptions Regarding Causes of Possible Impact Resulting from the Alternatives Including the Proposal; and are discussed further in this section in terms of activities which generate employment. The reader is referred to these pages and tables for a thorough understanding of the estimates, employment, and population effects.

Exploration Activity: After issuance of leases and required permits, exploratory drilling would be initiated. The exclusive use of semisubmersible drilling rigs is assumed; however, the use of other types of drilling units such as jack-ups may be possible. It is judged, however, that environmental conditions such as water depth (limiting the use of jack-ups) and the length and severity of storms (limiting the use of jack-ups and drillships) would restrict their widespread use. Indeed, the performance of the drillship Diamond M. Dragon, during the exploratory activities of sale CI, indicated that the inclement weather of lower Cook Inlet and Shelikof Strait would greatly hinder the activities of drillships.

In conducting an exploratory program, the operator typically performs supervisory and administrative functions, contracting with oil field service firms to perform the major drilling and logistic functions. These functions include drilling, mud engineering, well logging, completion services, diving, any predrilling biological or other surveys, and supply (vessels, aircraft, and shore based facilities). Operator personnel are typically composed of managers, operations superintendents, geologists, engineers, material expediters, and administrative support staff. These functions are detailed in the following paragraphs and are based upon previous drilling activity in the western Gulf of Alaska (OCS sale 39).

Based upon Gulf of Alaska experience, drilling contractor crews would likely work the same number of days on as off. ODECO used a 28-day rotation scedule with half the shipboard employees changing every 7 days. SEDCO used a 21-day rotation schedule. The rotation factor would be 2, thus total employment would be 68 per drilling platform.

Supply/support vessels used for exploratory activity would be similar to those used as a result of sale 39 and sale CI, i.e., supply vessels in the 200-foot class with 6,000-7,000 plus horsepower. Many would have anchor handling capability. (See Dames and Moore, 1979, pp. 11-13, for a detailed description of these supply vessels and cargo capabilities.) Each vessel is assumed to employ a crew of 13 on duty 24 hours per day, working 40 days on and 20 days off. Total employment per vessel would then be 20. Two supply vessels are assumed to serve each active rig; one of these vessels would always be in the vicinity of the rig in case emergency evacuation was required. Four would work the day shift, two the night shift, and one would accomplish miscellaneous tasks. Assuming employees worked 28 days on and 14 days off, total catering services employment would be 11 (Dames and Moore, 1979, pp. 36-37, from A.R.A. Services, Inc.).

Crew changes and light cargo transfer from ship-to-shore are assumed to be made via helicopter of a type similar in capability to the Sikorsky S-61's employed in previous Gulf of Alaska drilling. It is assumed one helicopter would be needed per rig, plus a common backup. For example, if only one platform were active, two helicopters would be required. Should more than one platform be employed, the total number of helicopters employed in the field would be N + 1. Where N equals the total number of platforms in the field and the + 1 is a backup helicopter.

Based on gulf experience, two pilots are required in flight and three mechanics are required per machine. Crews would work 14 days on and 14 days off, thus each active rig would employ a total of 10 (Dames and Moore, 1979, p. 38., from ERA Helicopters).

Shore bases serve as storage and transfer points for offshore operations. Heavy goods such as casing and drill pipe, water, fuel, muds and chemicals are stored and transferred to supply vessels for delivery offshore. Typical facilities include heliopads, runways, open and covered storage, mud, water and fuel storage, docks, and minor repair facilities.

The shore base complement at Yakutat employed some 90 personnel during previous exploratory activities in the eastern Gulf of Alaska. Of this number at least half were devoted to marine support activities. According to the tenets of the mean case scenario associated with the proposed action, Port Lions would have responsibility for air support activities only. As a result of this limited responsibility, the shore base complement at Port Lions would be reduced by at least half from that needed for Yakutat. In regard to the Nikiski support facility, it would need at least a full complement of 90 or more workers.

Mud engineering and mud logging may or may not be provided by the same firm. Mud engineering firms supply the drilling muds. Based upon previous gulf activity, 1 such engineering position is required during drilling; the position is filled by 1 engineer on call 24 hours per day, working 7 days on and 7 days off (Dames and Moore, August 1978, pp. 38-39, from Magcobar and Schlumberger). Extrapolating this experience to the future, 2 mud engineers would be required per rig, 1 on duty and 1 off duty.

Well logging services include mud logging and electric logging. Based upon Gulf of Alaska experience, mud logging typically requires 2 men on board the drilling rig, each working a 12-hour shift. Electric logging does not require a permanent crew aboard the vessel. Contracts with operators required 3 men assigned to each rig who would provide services as required. A typical trip to the rig for the 3 men would require about 5 days. Two or more trips might be made to the rig per month by the 3-man crew. Special problems could require more frequent service (Dames and Moore, August 1978, p. 39, from Schlumberger). Thus, employment per rig to perform the well logging function is 7.

Cementing is the primary completion service resulting in offshore employment. One engineer may be assigned to each rig. This engineer would be on call on a 24-hour basis, working 21 days on and 21 days off (Dames and Moore, 1979, p.40, from Halliburton). Cementing services would account for the employment of 2 engineers per active rig.

Diving services may involve up to 7 divers per rig; however, only 2 would live onboard to maintain and ready equipment between dives. Diving services would, thus account for a maximum of 7 employees per rig (Dames and Moore, 1979, p.40, from Oceaneering); 3 full time equivalents are assumed here.

As stated earlier, operators perform the supervisory and administrative functions governing an exploratory drilling program, overseeing drilling and logistics activities, evaluating drilling results and administrative support. The number of operator personnel varies by company, and presumably, by the specific drilling program itself. (Reference the Notices of Support Activity submitted by operators in compliance with sale 39, Stipulation No. 5.) Notices submitted as a result of sale 39 indicate a total operator complement of 10 per rig is representative, including onshore logistics personnel. Allowing 2 onshore logistics positions (already accounted for under the shore facility discussion), a total of 8 (additional) operator personnel per rig is assumed here.

Development Activities: The results of exploratory drilling would be evaluated and the decision made as to whether or not the next stage of operations would be undertaken. If the results of the exploratory activity do not reveal economically producible quantities of oil and/or gas, no further impacts would result from this proposed sale. However, for assessment purposes, exploratory drilling is assumed to yield commercial deposits of oil and natural gas.

The production of the estimated recoverable petroleum resources would require the construction and placement of production structures, and the drilling of development wells, along with the construction of support bases and facilities for gathering, storing, and transporting oil and gas from the acreage leased.

The precise type of production facilities, the number of development wells required, the location of any onshore facilities required, and the possible route of pipelines and other transportation facilities required to bring the produced oil and gas to shipping terminals would be dependent primarily on the information gained as a result of the exploratory drilling, modified by additional data obtained as a result of developmental drilling. Other factors influencing the type of facilities required (in addition to the number of fields and amount of resource discovered), are water depth, character of the sea floor, depth to the producing horizon, number of wells required for efficient recovery (i.e., the spacing of the wells), and the structural position of the producing wells.

Offshore Employment: Development activity is distinguished from exploration activity in terms of the level (and intensity) of activity and, to a lesser extent, functions performed. Drilling and well service personnel requirements are generally less. Assuming normal circumstances, measurements of well data are fewer, casing and drill string needs may be less and diving services generally are not needed. The reduced need for services decreases drilling related employment (on a per active rig basis) during the development phase.

Total onboard drilling crew requirements during the development phase are estimated at 27 (2 fewer than estimated for exploratory drilling); assuming a rotation factor of 2, total drilling crew employment would be 54 per active rig.

Total well service personnel requirements are estimated at 7. Functions included are mud engineering, cementing, special casing crews, and personnel which may be required in survey and fishing services. The estimate represents an average of well service personnel. Periodically, during the drilling of a well, special crews are needed to perform specialized functions, however, these tasks are of limited duration. Thus, an average of 7 is used to reflect these periodic services (Alaska OCS Office and personal communication with Mobil Oil, Anchorage, Alaska, February 1979).

Production platform operation personnel are estimated in table B-14. Production platforms placed in lower Cook Inlet would be similar to existing platforms in upper Cook Inlet, i.e., steel bottom-founded, with certain design accommodations, e.g., for greater water depth. Based upon upper Cook Inlet experience, onboard production employment is estimated at 23 per platform; a 1 week on, 1 week off work schedule is assumed. Hence, total employment per platform would be 46.

Catering services employment is assumed comparable to that estimated for exploration activity, i.e., a total of 11 would be employed in catering services.

Shore-based operating and supply/support personnel requirements are judged similar to exploration phase requirements. Each fully staffed shore base is assumed to require a total operating complement of 25, or half that amount when only 1 rig is active. Each active rig is assumed to require the services of 1 helicopter of the Sikorsky S-61 type, plus a common backup at all times. Each active (development) drilling rig is assumed to require the services of 2 supply vessels. Upon completion of development drilling, each platform is assumed to be serviced by a single supply vessel.

Table B-2 summarizes production, drilling, and supply/support related employment assumptions.

Technical and Management Operations Staff: The size of technical and management operations staffs (e.g., geologists, engineers, drilling foremen, and managers) would depend on the amount of development and production activity. Headquarters staff is assumed to number 30 individuals at the start of the production phase and decrease with the diminishing size of the field.

Construction Activity: Development and production activities must be preceded by the construction, installation, and assembly of permanent platforms, pipeline construction for transport of the produced oil and gas to production treatment facilities and terminals, and shore base construction.

Platform Installation: The installation of the platforms would involve the temporary employment of specific contractors for specific tasks such as platform construction, placement, pile driving, deck structure placement, and finishing. It is assumed all platforms would be constructed at facilities outside Alaska, towed to the field location, set in place, deck structures installed, and finished. Typically, tug crews, derrick barge personnel, welders, electricians, equipment installers, and others are employed for brief periods during placement and assembly of the platform.

The total number of personnel required to set and assemble multiple platforms per season would depend on many factors, such as the number of platforms to be set, environmental constraints (e.g., weather), the type and availability of equipment used, and the number of oil field operators involved. For assessment purposes, it is assumed a complete work crew consisting of the above mentioned skills approximates 100 workers. Because of the relatively short offshore construction season (approximately April to September), few economies of scale may be realized in platform installation. For example, the length of the construction season may not permit the use of a single derrick barge for deck structure placement on 2 platforms; 2 barges in simultaneous operation may be required. For purposes here, a complete complement of 6 crew and equipment to install each platform is assumed as required. Note, however, that individual crews would be on-site less than 6 months, and many would be housed offshore. It is assumed 14 months are required from installation to commissioning. Thus, in estimating average annual employment, 7 months of construction effort is allocated to the year a platform is shown as "installed," and 7 months of effort to the following year.

Pipeline Installation: Pipelines linking the platforms to terminals must be fabricated and installed using a pipe lay barge. On and offshore pipelines are assumed to be constructed. Offshore pipelines would be constructed by means of pipe lay barges working primarily during the summer season. It is anticipated that the major effort of onshore pipeline construction would also occur during the summer months. It is not expected that offshore pipeline construction would provide year-round employment, i.e., offshore pipeline construction would likely require approximately 6 months in any year.

It is anticipated that large pipe lay barges similar to those utilized in the North Sea would be used for offshore pipeline construction. These units are largely self-contained, including living quarters; thus, it is estimated that most of these personnel would be housed offshore.

Based upon experience in the North Sea, each lay barge of the type described can install approximately .5 mi of offshore pipeline per day, including an allowance for non-productive time due to weather conditions. It is estimated that three would be required for a period of 6 months, per construction season, in the installation of offshore pipelines. Workers are not normally rotated on and off the work location for off-duty periods, thus no rotation factor is assumed.

Estimated on and offshore pipeline construction employment for the development phase is shown in table B-12.

Onshore Facilities - Supply/Support Bases, Production Treatment and Crude Oil Terminal Facilities: The construction of onshore facilities would involve the employment of construction personnel on a variable basis depending upon the season and specific skill required at any given time. Existing facilities may be utilized (in the case of shore bases), as well as new facilities constructed near existing communities or in remote locations. At remote construction sites, personnel would probably be housed in camps and be similarly housed in camps near existing communities where the community infrastructure cannot accommodate the additional services required.

Production Treatment and Crude Oil Terminal Facilities: The size, nature, and capacity of production treatment facilities would depend upon many factors, including the volume of water produced. For example, greater quantities of water requiring treatment may be produced in the latter stages of a field's production life than in the initial years of production. Thus, as greater treatment is required, employment may increase. It is assumed here, however, that each production treatment facility would require a total of 85 employees throughout its life. It is also assumed that production treatment facilities are co-located with the oil terminal.

Based on upper Cook Inlet experience (Drift River), approximately 30 personnel would be required to operate each crude oil terminal, along with an administrative support staff of 5, for a total of 35. Each crude oil tanker terminal facility would employ a total of 120 workers, 85 in production treatment operations and 35 in storage and tanker terminal operations (Alaska OCS Office, from Kenai Pipeline Co., 1978).

Supply/Support Base Construction: Supply/support bases would be required to service offshore development and production activity. Potential sites include those where the necessary facilities would be expanded upon the existing infrastructure (e.g., enlargement of piers, site improvement, etc.), and those where supply/support facilities would be constructed "from the ground up" at remote sites. Because this possible mix of facilities use/construction is unknown, and because engineering requirements would vary from site-to-site, it is not possible to estimate construction employment with any accuracy. An allowance of 75 workers for a period of 1 year is therefore included in an attempt to reflect this activity (Alaska OCS Office, from Bomhoff Associates, 1978). These workers would consist of "offshore" crews (pile driving, tug and barge personnel employed in pier loading or dock construction), heavy equipment operators, carpenters, welders, electricians, etc.

Construction activity would likely continue through the life of production due to upgrading and expansion or addition of facilities. However, the level of activity may vary greatly from year-to-year and, excepting major projects, would be small compared to the initial years of the development phase.

Table B-1
Lower Cook Inlet/Shelikof Strait
95 Percent Scenario
Estimated Development Employment - Development Phase

Year	Development Drilling (Mining) 1/ 2/ (Wells)		Supply Support Aircraft/Vessels (Transportation)	Shore Bases (Mining)	Headquarters (Mining)	Oil Terminal (Transportation)	Production Operations (Mining)	Total Man Months	Average Monthly Employment
1981									
1982									
1983									
1984									
1985									
1986	(16)	1736	1320	720	25	720		4521	377
1987	(24)	2471	1320	720	50	1440	1104	7105	592
1988	(28)	2839	1320	720	184	1440	1104	7607	634
1989	(28)	2839	1320	720	321	1440	1104	7744	645
1990			1320	720	364	1440	1104	4948	412
1991	(18)	1656	720	720	364	1440	1368	6268	522
1992	(18)	1656	720	720	364	1440	1368	6268	522
1993	(18)	1656	720	720	364	1440	1368	6268	522
1994	(18)	1656	720	720	364	1440	1368	6268	522
1995	(18)	1656	720	720	364	1440	1368	6268	522
1996	(18)	1656	720	720	364	1440	1368	6268	522
1997	(18)	1656	720	720	364	1440	1368	6268	522
1998	(18)	1656	720	720	364	1440	1368	6268	522
1999	(18)	1656	720	720	364	1440	1368	6268	522
2000	(18)	1656	720	720	364	1440	1368	6268	522
2001	(18)	1656	720	720	364	1440	1368	6268	522
2002	(18)	1656	720	720	364	1440	1368	6268	522
2003	(18)	1656	720	720	364	1440	1368	6268	522
2004	(18)	1656	720	720	364	1440	1368	6268	522
2005	(18)	1656	720	720	364	1440	1368	6268	522
2006	(15)	1380	720	720	364	1440	1368	5992	499
2007	(13)	1196	720	720	364	1440	1368	5808	484
2008	(10)	920	720	720	364	1440	1368	5532	461
2009			720	720	364	1440	1368	4612	384
2010			720	360	182	720	684	2666	222
2011									
2012									
2013									
2014									
2015									

1/ Assumes 1.333 months to drill one well.
2/ Workover wells start year 1991.
Assume wells need workover @ 5-year interval.

Table B-2
Lower Cook Inlet/Shelikof Strait
Mean Scenario
Estimated Development Employment - Development Phase

Year	Development Drilling (Mining) 1/ 2/	Supply Support Aircraft/Vessels (Transportation)	Shore Bases (Mining)	Headquarters (Mining)	Oil Terminal (Transportation)	Production Operations (Mining)	Total Man Months	Average Monthly Employment
	(Wells)							
1981								
1982								
1983								
1984								
1985								
1986	(26)	2787	1920	720	25	1440	6892	574
1987	(42)	4391	2520	720	50	2880	12769	1064
1988	(42)	4391	2520	720	185	2880	12904	1075
1989	(42)	4391	2520	720	372	2880	13091	1091
1990	(42)	4391	2520	720	552	2880	13271	1106
1991	(36)	3311	1560	720	636	2880	11843	987
1992	(35)	3219	1560	720	636	2880	11751	979
1993	(35)	3219	1560	720	636	2880	11751	979
1994	(35)	3219	1560	720	636	2880	11751	979
1995	(35)	3219	1560	720	636	2880	11751	979
1996	(35)	3219	1560	720	636	2880	11751	979
1997	(35)	3219	1560	720	636	2880	11751	979
1998	(35)	3219	1560	720	636	2880	11751	979
1999	(35)	3219	1560	720	636	2880	11751	979
2000	(35)	3219	1560	720	636	2880	11751	979
2001	(35)	3219	1560	720	636	2880	11751	979
2002	(35)	3219	1560	720	636	2880	11751	979
2003	(35)	3219	1560	720	636	2880	11751	979
2004	(35)	3219	1560	720	636	2880	11751	979
2005	(35)	3219	1560	720	636	2880	11751	979
2006	(30)	2759	1560	720	636	2880	11751	979
2007	(25)	2299	1560	720	636	2880	11291	941
2008	(20)	1840	1560	720	636	2880	10831	903
2009	(12)	1104	1200	720	636	2880	10372	864
2010	(12)	1104	720	360	636	2880	8592	716
2011			480	360	636	2880	7068	589
2012			480	360	318	1440	5040	420
2013						684	3282	274
2014								
2015								

1/ Assumes 1.333 months to drill one well.
2/ Workover wells start year 1991.
Assume wells need workover @ 5-year interval.

Table B-3
Lower Cook Inlet/Shelikof Strait
5 Percent Scenario (Maximum Case)
Estimated Development Employment - Development Phase

Year	Development Drilling (Mining) 1/ 2/ (Wells)		Supply Support Aircraft/Vessels (Transportation)	Shore Bases (Mining)	Headquarters (Mining)	Oil Terminal (Transportation)	Production Operations (Mining)	Total Man Months	Average Monthly Employment
1981									
1982									
1983									
1984									
1985									
1986	(32)	3339	1920	720	25	1440		7444	620
1987	(60)	6179	3120	720	50	2880	2760	15709	1309
1988	(60)	6311	3720	720	185	2880	3312	17128	1427
1989	(60)	6311	3720	720	375	2880	3312	17318	1443
1990	(53)	4875	3120	720	558	2880	4104	16257	1355
1991	(69)	6346	2160	720	692	2880	4104	16902	1409
1992	(67)	6162	2160	720	794	2880	4104	16820	1402
1993	(53)	4875	2160	720	821	2880	4104	15560	1297
1994	(53)	4875	2160	720	821	2880	4104	15560	1297
1995	(53)	4875	2160	720	821	2880	4104	15560	1297
1996	(53)	4875	2160	720	821	2880	4104	15560	1297
1997	(53)	4875	2160	720	821	2880	4104	15560	1297
1998	(53)	4875	2160	720	821	2880	4104	15560	1297
1999	(53)	4875	2160	720	821	2880	4104	15560	1297
2000	(53)	4875	2160	720	821	2880	4104	15560	1297
2001	(53)	4875	2160	720	821	2880	4104	15560	1297
2002	(53)	4875	2160	720	821	2880	4104	15560	1297
2003	(53)	4875	2160	720	821	2880	4104	15560	1297
2004	(53)	4875	2160	720	821	2880	4104	15560	1297
2005	(53)	4875	2160	720	821	2880	4104	15560	1297
2006	(45)	4139	2160	720	821	2880	4104	14824	1235
2007	(37)	3403	2160	720	821	2880	4104	14088	1174
2008	(30)	2759	2160	720	821	2880	4104	13444	1120
2009	(15)	1380	2160	720	821	2880	4104	12065	1005
2010	(10)	920	1440	720	821	2880	2736	9517	793
2011	(8)	736	1080	720	821	2880	2052	8289	691
2012	(4)	368	720	720	821	2880	1368	6877	573
2013			720	720	821	2880	684	5825	486
2014			720	360	410	1440	684	3614	301
2015									

1/ Assumes 1.333 months to drill one well.
2/ Workover wells start year 1991.
Assume wells need workover @ 5-year interval.

Table B-4
Lower Cook Inlet/Shelikof Strait
Alternative IV
Estimated Development Employment - Development Phase

Year	Development Drilling (Mining) 1/ 2/ (Wells)		Supply Support - Aircraft/Vessels (Transportation)	Shore Bases (Mining)	Headquarters (Mining)	Oil Terminal (Transportation)	Production Operations (Mining)	Total Man Months	Average Monthly Employment
1981									
1982									
1983									
1984									
1985									
1986	(18)	1920	1320	720	25	720		4705	392
1987	(28)	2839	1320	720	49	1440	1104	7472	623
1988	(28)	2839	1320	720	181	1440	1104	7604	634
1989	(2)	184	720	720	287	1440	1368	4719	393
1990			720	720	287	1440	1368	4535	378
1991	(15)	1380	720	720	287	1440	1368	5915	493
1992	(15)	1380	720	720	287	1440	1368	5915	493
1993	(15)	1380	720	720	287	1440	1368	5915	493
1994	(15)	1380	720	720	287	1440	1368	5915	493
1995	(15)	1380	720	720	287	1440	1368	5915	493
1996	(15)	1380	720	720	287	1440	1368	5915	493
1997	(15)	1380	720	720	287	1440	1368	5915	493
1998	(15)	1380	720	720	287	1440	1368	5915	493
1999	(15)	1380	720	720	287	1440	1368	5915	493
2000	(15)	1380	720	720	287	1440	1368	5915	493
2001	(15)	1380	720	720	287	1440	1368	5915	493
2002	(15)	1380	720	720	287	1440	1368	5915	493
2003	(15)	1380	720	720	287	1440	1368	5915	493
2004	(15)	1380	720	720	287	1440	1368	5915	493
2005	(12)	1104	720	720	287	1440	1368	5915	493
2006	(12)	1104	720	720	287	1440	1368	5639	470
2007	(8)	736	720	720	287	1440	1368	5639	470
2008	(2)	184	480	720	287	1440	1368	5271	439
2009			480	720	287	1440	1368	4479	373
2010			480	360	141	720	684	2385	199

1/ Assumes 1.333 months to drill one well.
2/ Workover wells start year 1991.
Assume wells need workover @ 5-year interval.

Table B-5
Lower Cook Inlet/Shelikof Strait
Alternative V
Estimated Development Employment - Development Phase

Year	Development Drilling (Mining) 1/ 2/		Supply Support Aircraft/Vessels (Transportation)	Shore Bases (Mining)	Headquarters (Mining)	Oil Terminal (Transportation)	Production Operations (Mining)	Total Man Months	Average Monthly Employment
	(Wells)								
1981									
1982									
1983									
1984									
1985									
1986	(24)	2471	1320	720	25	720		5256	438
1987	(24)	2471	1320	720	50	1440	1104	7105	592
1988	(5)	460	720	720	159	1440	1368	4867	406
1989			720	720	216	1440	1368	4464	372
1990			720	720	216	1440	1368	4464	372
1991	(11)	1012	720	720	216	1440	1368	5476	456
1992	(11)	1012	720	720	216	1440	1368	5476	456
1993	(11)	1012	720	720	216	1440	1368	5476	456
1994	(11)	1012	720	720	216	1440	1368	5476	456
1995	(11)	1012	720	720	216	1440	1368	5476	456
1996	(11)	1012	720	720	216	1440	1368	5476	456
1997	(11)	1012	720	720	216	1440	1368	5476	456
1998	(11)	1012	720	720	216	1440	1368	5476	456
1999	(11)	1012	720	720	216	1440	1368	5476	456
2000	(11)	1012	720	720	216	1440	1368	5476	456
2001	(11)	1012	720	720	216	1440	1368	5476	456
2003	(11)	1012	720	720	216	1440	1368	5476	456
2004	(11)	1012	720	720	216	1440	1368	5476	456
2005	(7)	644	720	720	216	1440	1368	5108	426
2006	(5)	459	720	720	216	1440	1368	4923	410
2007	(2)	184	480	360	216	1440	1368	4048	337
2008			480	360	216	1440	1368	3864	322
2009			480	360	158	720	684	2402	200

1/ Assumes 1.333 months to drill one well.
2/ Workover wells start year 1991.
Assume wells need workover @ 5-year interval.

Table B-6
Lower Cook Inlet/Shelikof Strait
95 Percent Scenario (Minimum Case)
Estimated Employment - Exploratory Phase
(Equipment/Man-Months)

Years	Drilling Rigs (Mining)[1/]		Supply Support Aircraft/Vessels (Transportation)		Shore Bases	Total Man Months	Average Monthly Employment
1981	Sale--September						
1982	(1)	455	(2/2)	270	360	1085	90
1983	(2)	1364	(3/4)	765	720	2849	237
1984	(2)	1818	(3/4)	990	720	3528	294
1985	(2)	909	(3/4)	495	720	2124	177
1986	(1)	455	(2/2)	270	360	1085	90

1/ Assume 4.5 months to drill one well.

Table B-7
Lower Cook Inlet/Shelikof Strait
Mean Scenario
Estimated Employment - Exploratory Phase
(Equipment/Man-Months)

Years	Drilling Rigs (Mining)[1/]		Supply Support Aircraft/Vessels (Transportation)		Shore Bases	Total Man Months	Average Monthly Employment
1981	Sale--September						
1982	(2)	1364	(3/4)	765	720	2849	237
1983	(3)	1818	(4/6)	1080	720	3618	302
1984	(3)	1818	(4/6)	1080	720	3618	302
1985	(2)	1364	(3/4)	765	720	2849	237
1986	(1)	909	(2/2)	540	720	2169	181

1/ Assume 4.5 months to drill one well.

Table B-8
Lower Cook Inlet/Shelikof Strait
5 Percent Scenario (Maximum Case)
Estimated Employment - Exploratory Phase
(Equipment/Man-Months)

Years	Drilling Rigs (Mining)[1/]		Supply Support Aircraft/Vessels (Transportation)		Shore Bases	Total Man Months	Average Monthly Employment
1981	Sale--September						
1982	(2)	1818	(3/4)	990	720	3528	294
1983	(3)	2727	(4/6)	1440	720	4887	407
1984	(5)	4091	(6/10)	2115	720	6926	577
1985	(3)	2727	(4/6)	1440	720	4887	407
1986	(2)	909	(3/4)	495	720	2124	177
1987	(1)	455	(2/2)	270	720	1445	120

1/ Assume 4.5 months to drill one well.

Table B-9
Lower Cook Inlet/Shelikof Strait
Alternative IV
Estimated Employment - Exploratory Phase
(Equipment/Man-Months)

Years	Drilling Rigs (Mining)[1/]		Supply Support Aircraft/Vessels (Transportation)		Shore Bases	Total Man Months	Average Monthly Employment
1981	Sale--September						
1982	(2)	909	(3/4)	495	360	1764	147
1983	(2)	1364	(3/4)	765	720	2849	237
1984	(2)	1364	(3/4)	765	720	2849	237
1985	(1)	909	(2/2)	540	720	2169	181

1/ Assume 4.5 months to drill one well.

Table B-10
Lower Cook Inlet/Shelikof Strait
Alternative V
Estimated Employment - Exploratory Phase
(Equipment/Man-Months)

Years	Drilling Rigs (Mining)[1/]		Supply Support Aircraft/Vessels (Transportation)		Shore Bases	Total Man Months	Average Monthly Employment
1981	Sale--September						
1982	(1)	455	(2/2)	270	360	1085	90
1983	(2)	909	(3/4)	495	720	2124	177
1984	(2)	909	(3/4)	495	720	2124	177
1985	(1)	455	(2/2)	270	360	1085	90

1/ Assume 4.5 months to drill one well.

Table B-11
Lower Cook Inlet/Shelikof Strait
95 Percent Scenario (Minimum Case)
Estimated Construction Employment - Development Phase

Year	Platform Installation	Shore Base[1]	Pipeline Construction[3]	Oil Terminal[2]	Total Man Months	Average Monthly Employment
1981						
1982		(2) 670			670	56
1983						
1984						
1985	(1) 1250		2130		3380	282
1986	(1) 1250		1201	(1) 2700	5151	429
1987			131	1350	1481	123

1/ Assume expansion of existing facilities - 67 people for five months for both shore bases (Dames and Moore).

2/ Assume 225 people for 18 months (Dames and Moore).

3/ Assume 2 miles per day for onshore pipeline construction on Kenai. It should be noted that this ratio is only an approximation. Too many factors, such as right-of-way location, type of terrain, time of year, diameter of pipe, construction specifications, and river crossings can influence this ratio.

Table B-12
Lower Cook Inlet/Shelikof Strait
Mean Case
Estimated Construction Employment - Development Phase

Year	Platform Installation	Shore Base[1]	Pipeline Construction[3]	Oil Terminal[2]	Total Man Months	Average Monthly Employment
1981						
1982		(2) 3155			3155	263
1983						
1984						
1985	(1) 1250		2130		3380	282
1986	(2) 2500		2327	(2) 5400	10227	852
1987	(1) 1250		197	2700	4738	395

1/ Assume expansion of facilities on Kenai - 67 people for 5 months and major construction at Cape Chiniak - 235 people for 12 months. (Source: Dames and Moore)

2/ Assume 225 people for 18 months (Dames and Moore).

3/ Assume 2 miles per day for onshore pipeline construction on Kenai and 1 mile per day for construction on Kodiak. It should be noted that this ratio is only an approximation. Too many factors, such as right-of-way location, type of terrain, time of year, diameter of pipe, construction specifications, and river crossings can influence this ratio.

Table B-13
Lower Cook Inlet/Shelikof Strait
5 Percent Scenario (Maximum Case)
Estimated Construction Employment - Development Phase

Year	Platform Installation	Shore Base[1]	Pipeline Construction[3]	Oil Terminal[2]	Total Man Months	Average Monthly Employment
1981						
1982		(2) 3155			3155	263
1983						
1984						
1985	(3) 3750		2130		5880	490
1986	(2) 2500		2568	(2) 5400	10468	872
1987	(1) 1250		219	2700	4169	347

1/ Assume expansion of facilities on Kenai (64 people for 5 months) and major construction at Cape Chiniak (235 people for 12 months). (Source: Dames and Moore)

2/ Assume 225 people for 18 months (Dames and Moore).

3/ Assume 2 miles per day for onshore pipeline construction on Kenai and 1 mile per day for construction on Kodiak. It should be noted that this ratio is only an approximation. Too many factors, such as right-of-way location, type of terrain, time of year, diameter of pipe, construction specifications, and river crossings can influence this ratio.

Table B-14
Lower Cook Inlet/Shelikof Strait
Alternative IV
Estimated Construction Employment - Development Phase

Year	Platform Installation	Shore Base[1]	Pipeline Construction[3]	Oil Terminal[2]	Total Man Months	Average Monthly Employment
1981						
1982		(2) 670			670	56
1983						
1984						
1985	(1) 1250		2130		3380	282
1986	(1) 1250		601	(1) 2700	4551	379
1987			131	1350	1481	123

1/ Assume expansion of existing facilities - 67 people for five months for both shore bases (Dames and Moore).

2/ Assume 225 people for 18 months (Dames and Moore).

3/ Assume 2 miles per day for onshore pipeline construction on Kenai. It should be noted that this ratio is only an approximation. Too many factors, such as right-of-way location, type of terrain, time of year, diameter of pipe, construction specifications, and river crossings can influence this ratio.

Table B-15
Lower Cook Inlet/Shelikof Strait
Alternative V
Estimated Construction Employment - Development Phase

Year	Platform Installation	Shore Base[1/]	Pipeline Construction[3/]	Oil Terminal[2/]	Total Man Months	Average Monthly Employment
1981						
1982		(2) 670			670	56
1983						
1984						
1985	(1) 1250		2130		3380	282
1986	(1) 1250		569	(1) 2700	4159	377
1987			131	1350	1481	123

1/ Assume expansion of existing facilities (67 people for five months) for both shore bases (Dames and Moore).

2/ Assume 225 people for 18 months (Dames and Moore).

3/ Assume 2 miles per day for onshore pipeline construction on Kenai. It should be noted that this ratio is only an approximation. Too many factors, such as right-of-way location, type of terrain, time of year, diameter of pipe, construction specifications, and river crossings can influence this ratio.

Table B-16
Lower Cook Inlet/Shelikof Strait
95 Percent Scenario (Minimum Case)
Summary of Direct Employment

Year	Mining	Construction	Transportation	Total	Average Monthly Employment
1981	Sale--September				
1982	815	670	270	1755	146
1983	2084		765	2849	237
1984	2538		990	3528	294
1985	1629	3380	495	5504	459
1986	3296	5151	2310	10757	896
1987	4345	1481	2760	8586	716
1988	4847		2760	7607	634
1989	4984		2760	7744	645
1990	2188		2760	4948	412
1991	4108		2160	6268	522
1992	4108		2160	6268	522
1993	4108		2160	6268	522
1994	4108		2160	6268	522
1995	4108		2160	6268	522
1996	4108		2160	6268	522
1997	4108		2160	6268	522
1998	4108		2160	6268	522
1999	4108		2160	6268	522
2000	4108		2160	6268	522
2001	4108		2160	6268	522
2002	4108		2160	6268	522
2003	4108		2160	6268	522
2004	4108		2160	6268	522
2005	4108		2160	6268	522
2006	3832		2160	5992	499
2007	3648		2160	5808	484
2008	3372		2160	5532	461
2009	2452		2160	4612	384
2010	1226		1440	2666	222

Table B-17
Lower Cook Inlet/Shelikof Strait
Mean Scenario
Summary of Direct Employment

Year	Mining	Construction	Transportation	Total	Average Monthly Employment
1981	Sale--September				
1982	2084	3155	765	6004	500
1983	2538		1080	3618	302
1984	2538		1080	3618	302
1985	2084	3380	765	6229	519
1986	5161	10227	3900	19288	1607
1987	7369	4738	5400	17507	1459
1988	7504		5400	12904	1075
1989	7691		5400	13091	1091
1990	7871		5400	13271	1106
1991	7403		4440	11843	987
1992	7311		4440	11751	979
1993	7311		4440	11751	979
1994	7311		4440	11751	979
1995	7311		4440	11751	979
1996	7311		4440	11751	979
1997	7311		4440	11751	979
1998	7311		4440	11751	979
1999	7311		4440	11751	979
2000	7311		4440	11751	979
2001	7311		4440	11751	979
2002	7311		4440	11751	979
2003	7311		4440	11751	979
2004	7311		4440	11751	979
2005	7311		4440	11751	979
2006	6851		4440	11291	941
2007	6391		4440	10831	903
2008	5932		4440	10372	864
2009	4512		4080	8592	716
2010	3468		3600	7068	589
2011	1680		3360	5040	420
2012	1362		1920	3282	274

Table B-18
Lower Cook Inlet/Shelikof Strait
5 Percent Scenario (Maximum Case)
Summary of Direct Employment

Year	Mining	Construction	Transportation	Total	Average Monthly Employment
1981	Sale--September				
1982	2538	3155	990	6683	557
1983	3447		1440	4887	407
1984	4811		2115	6926	577
1985	3447	5880	1440	10767	897
1986	5713	10468	3855	20036	1670
1987	10884	4169	6270	21323	1777
1988	10528		6600	17128	1427
1989	10718		6600	17318	1443
1990	10257		6000	16257	1355
1991	11862		5040	16902	1409
1992	11780		5040	16820	1402
1993	10520		5040	15560	1297
1994	10520		5040	15560	1297
1995	10520		5040	15560	1297
1996	10520		5040	15560	1297
1997	10520		5040	15560	1297
1998	10520		5040	15560	1297
1999	10520		5040	15560	1297
2000	10520		5040	15560	1297
2001	10520		5040	15560	1297
2002	10520		5040	15560	1297
2003	10520		5040	15560	1297
2004	10520		5040	15560	1297
2005	10520		5040	15560	1297
2006	9784		5040	14824	1235
2007	9048		5040	14088	1174
2008	8404		5040	13444	1120
2009	7025		5040	12065	1005
2010	4477		5040	9517	793
2011	4329		3960	8289	691
2012	3277		3600	6877	573
2013	2225		3600	5825	485
2014	1454		2160	3614	301

Table B-19
Lower Cook Inlet/Shelikof Strait
Alternative IV
Summary of Direct Employment

Year	Mining	Construction	Transportation	Total	Average Monthly Employment
1981	Sale--September				
1982	1269	670	495	2434	203
1983	2084		765	2849	237
1984	2084		765	2849	237
1985	1629	3380	540	5549	462
1986	2665	4551	2040	9256	771
1987	4712	1481	2760	7472	623
1988	4844		2760	7604	634
1989	2559		2160	4719	393
1990	2375		2160	4535	378
1991	3755		2160	5915	493
1992	3755		2160	5915	493
1993	3755		2160	5915	493
1994	3755		2160	5915	493
1995	3755		2160	5915	493
1996	3755		2160	5915	493
1998	3755		2160	5915	493
2000	3755		2160	5915	493
2001	3755		2160	5915	493
2002	3755		2160	5915	493
2003	3755		2160	5915	493
2004	3755		2160	5915	493
2005	3479		2160	5639	470
2006	3479		2160	5639	470
2007	3111		2160	5271	439
2008	2559		1920	4479	373
2009	2375		1920	4295	358
2010	1185		1200	2385	199

Table B-20
Lower Cook Inlet/Shelikof Strait
Alternative V
Summary of Direct Employment

Year	Mining	Construction	Transportation	Total	Average Monthly Employment
1981	Sale--September				
1982	815	670	270	1755	146
1983	1629		495	2124	177
1984	1629		495	2124	177
1985	815	3380	270	4465	372
1986	3216	4519	2040	9775	815
1987	4345	1481	2760	8586	716
1988	2707		2160	4867	406
1989	2304		2160	4464	372
1990	2304		2160	4464	372
1991	2304		2160	4464	372
1992	2304		2160	4464	372
1993	2304		2160	4464	372
1994	2304		2160	4464	372
1995	2304		2160	4464	372
1996	2304		2160	4464	372
1998	2304		2160	4464	372
2000	2304		2160	4464	372
2001	2304		2160	4464	372
2002	2304		2160	4464	372
2003	2304		2160	4464	372
2004	3316		2160	5476	456
2005	2948		2160	5108	426
2006	2763		2160	4923	410
2007	2128		1920	4048	337
2008	1944		1920	3864	322
2009	1202		1200	2402	200

APPENDIX C

USGS ANALYSIS OF GULF OF ALASKA OCS OPERATING ORDERS

OCS ORDERS

OCS Orders are formally numbered directives issued to implement the provisions of Title 30 of the Code of Federal Regulations governing Oil and Gas Operations on the Outer Continental Shelf.

OCS Orders Nos. 1, 2, 3, 4, 5, 7, and 12, for the Gulf of Alaska were initially published in the Federal Register on January 3, 1975, with an invitation for the submission of comments and recommendations. The issuance of Outer Continental Shelf (OCS) Orders for the Gulf of Alaska was formally published by Federal Register Notice of March 9, 1976.

The Gulf of Alaska Orders were revised on May 18, 1979, after comments and recommendations were solicited by Federal Register Notice, June 29, 1977, (Vol. 42, No. 125) and August 25, 1977, (Vol. 42, No. 165).

Present OCS Orders 1, 2, 3, 4, 5, 6, 7, 8, and 12, were made effective by Federal Register Notice (Vol. 44, No. 247) Friday, December 21, 1979. The effective date of the present Orders was January 1, 1980.

Present Gulf of Alaska Orders cover the Gulf of Alaska, Cook Inlet, Kodiak, and the Southern Aleutian Shelf sale areas.

The following is an analysis of the present orders:

Gulf of Alaska OCS Order No. 1

This order requires all platforms, drilling rigs, drilling ships, and wells to have signs of standard specifications for identification of the operator, the specific lease block of operation, and well number.

This Order also requires that all subsea objects, resulting from lease operations which could present a hazard to other users of the OCS, must be identified by navigational markings as directed by the U.S. Coast Guard District Commander. Under this provision, the potential of accidents associated with subsea production systems, "stubs", fishing gear, and ship anchors, is substantially reduced as is the possibility of an oil spill from such an accident.

This Order also requires, whenever practicable, owner's identification, as approved or prescribed by the Director, to be placed upon all materials, cable, equipment, tools, containers, and other objects which could be freed and lost overboard from rigs, platforms, or supply vessels, and are of sufficient size, or are of such a nature, that they could be expected to interfere with commercial fishing gear if dropped overboard.

The Order mitigates impacts caused by offshore drilling and completion operations, fishing anchoring, shipping, and navigation activities.

Gulf of Alaska OCS Order No. 2

Proposed Order No. 2 concerns procedures for the drilling of wells. It requires the operators to file, under an approved exploration or a Development and Production Plan, a drilling application which includes information on the drilling platform or vessel, well casing, mud control, safety training of the operator's personnel, and a list describing critical drilling operations which may be performed. The Order then describes certain procedures, or equipment, to be used in each phase of the drilling operation.

Due to the technical complexity of the Order, not all details are included in describing its mitigatory impact. This proposed Order requires that drilling platforms and vessels to be capable of withstanding the oceanographic and meteorological conditions of the area; applications must include all pertinent data on the fitness of the platform or vessel, and each such drilling structure must be inspected by the U. S. Geological Survey (USGS) for compliance with the OCS Orders. During the period of operations, operators must collect and report oceanograhic, meteorological, and performance data. These requirements should mitigate concerns about the impact of weather, waves, sediment scour, and currents on offshore drilling units.

Order No. 2 requires operators to conduct shallow geological hazard surveys of the well site or lease block, prior to the commencement of drilling operations. The purpose of each survey is to locate shallow gas deposits, near-surface faults, obstructions, unstable bottom areas, or other conditions which are hazardous to drilling operations.

All wells must be cased and cemented to support unconsolidated sediments and to prevent communication of fluids between the formations, or pressure changes in the well. If there are indications of improper cementing, the operator shall re-cement and run logs to insure proper sealing of the well, or take other actions as approved by the Supervisor. The casing design and setting depths are to be based on all engineering and geologic factors, including the presence or absence of hydrocarbons, potential geologic hazards, and water depths. Additional casing strings may be required if abnormal geopressures are encountered. A pressure test is required of all casing strings, except the drive or structural casing, to determine the presence of leaks or inadequate cementing. The use of casing decribed in this Order should eliminate potential impacts of freshwater zone contamination, lost production, or the possibility of accidents caused by inadequate well control.

Operators are required to obtain directional surveys on all wells. These surveys, which are filed with the Supervisor, indicate whether the well is drilled in accordance with the planned bore hole migration. These surveys also provide the information required for the "target" of a relief well in the event of a blowout.

Blowout preventers and related pressure control equipment must be installed, used, and tested in a manner necessary to insure positive well control. A specific number of these preventers must be used in every well, and they

must be equipped with dual control systems. The blowout preventers and related control equipment shall be adequately protected to ensure reliable operation under existing weather conditions. Special requirements are included for floating drilling operations which necessitate the placement of the blowout preventer stack on the sea floor. These devices provide protection against oil spills resulting from a loss of well control.

There are specific requirements for the use and testing of drilling muds. Drilling muds have a number of critical functions, one of the most important being the control of sub-surface pressures and the prevention of gaseous and liquid influxes into the wellbore. Drilling mud programs must be approved prior to the commencement of drilling. The operator must, at all times, maintain sufficient and readily accessible quantities of mud to insure well control. Drilling operations shall be suspended in the absence of minimum quantities of mud material specified, or as modified in the approved plan.

Representatives of the operator must provide on-site supervision of drilling operations around the clock. A member of the drilling crew, or the Tool Pusher, must maintain surveillance of the rig floor continuously from the time drilling operations commence until the well is secured with blowout preventors, bridge plugs, storm packer, or cement plugs. Lessee and drilling contractor personnel shall be trained and qualified in present-day methods of well control, and records of the training are to be kept at the well site. Specific well control training requirements are outlined in Geological Survey OCS Standard No. T1 (GSS-OCS-T1). The training requirements are intended to minimize the potential for well blowouts caused by human error. Formal training is supplemented with weekly blowout-prevention exercises for all rig personnel. Drills are frequently witnessed by USGS representatives and must always be recorded in the Driller's log.

Procedures to be followed when drilling operations may penetrate reservoirs known or expected to contain hydrogen sulfide (H_2S), or in areas where the presence of H_2S is unknown, are included in U.S. Geological Survey OCS Standard No. 1 (GSS-OCS-1), "Safety Requirements for Drilling Operations in a Hydrogen Sulfide Environment." This set of standard operating procedures will assure proper equipment testing, and crew training, should highly toxic H_2S be encountered. Hazards of H_2S are substantially reduced by the institution of these procedures.

Since some operations performed in drilling are considered more critical than others with respect to well control, and for the prevention of fire, explosions, oil spills, and other discharges and emmissions, each lessee must file a Critical Operations and Curtailment Plan for the Supervisor's approval.

This Order includes a requirement for listing and describing of critical operations that are likely to be conducted on the lease. Before exceeding the operational limits of an approved plan, the operator must notify the Supervisor and curtail operations. This allows the USGS to provide either specific approval in advance of the conduct of the critical operation, or to dispatch personnel to the lease site for observation of the operation. This

part of OCS Order No. 2 provides additional regulatory review of drilling operations which may be hazardous to the drilling platform, vessel, crew, and the environment.

Order No. 2 also requires that when sufficient geological and engineering information is obtianed as a result of drilling operations, the lessee may make an application, or the Supervisor may require an application, for the establishment of field drilling rules. After field drilling rules have been established by the Supervisor, development wells shall be drilled in accordance with these rules, and the requirements of this Order, which are not affected by such rules.

In accordance with Section 21 of the OCS Lands Act Amendment of 1978, this Order requires the use of the Best Available and Safest Technologies (BAST). (This is discussed in the analysis of Order 5.)

Gulf of Alaska OCS Order No. 3

This Order relates to the plugging and abandonment of wells. For permanent abandonment of wells, cement plugs must be placed so as to extend above the top, and below the bottom, of freshwater and oil or gas zones to prevent those fluids from escaping into other strata. Portions of a well in which abnormal pressures are encountered are also required to be isolated with cement plugs. Plugs are required at the bottom of the deepest casing where an uncased hole exits below. Plugs or cement retainers are required to be placed above and below any perforated interval of the well hole used for production of oil and gas. If casing is cut and recovered, the casing stub shall be plugged.

Any annular space communicating with any open hole and extending to the ocean floor shall be plugged with cement. A surface plug at least 45 meters (148 feet) in length, with the top of the plug 45 meters (148 feet) or less below the ocean floor, shall be placed in the smallest string of casing which extends to the ocean floor.

The setting and location of the first plug below the surface casing shall be verified by either placing a minimum pipe weight on top of the plug or by pressure testing it with a designated minimum pump pressure. The space between the plugs must be filled with drilling mud of sufficient density to exceed the greatest formation pressure encountered in drilling the interval.

The casing and piling on the sea floor must be removed to a depth below the ocean floor as approved by the Supervisor. For temporary abandonments, all plugs and mud, discussed above, must be placed in the well with the exception of the surface plug. (The temporary abandoned well would have to be marked in accordance with Order No. 1.)

This Order should eliminate concern about contamination of freshwater zones or the possibility of oil and gas leaks from abandoned wells. The requirements that the sea floor above each final abandonment must be

cleared, and that the removal depth of casing and piling must be examined on a case-by-case basis, will provide protection to navigation and fishery interest. The chance that obstructions might become exposed due to changes in bottom conditions is reduced as well.

Gulf of Alaska OCS Order No. 4

Order No. 4 provides for the extension of a lease beyond its primary term for as long as oil or gas may be produced in paying quantities and the lessee has met the requirements for diligent development. If these circumstances should occur, a lease can be extended beyond its initial term pursuant to the authority prescribed in 30 CFR 250.10 and 250.11, and in accordance with 30 CFR 250.12.

In addition to a production test for oil, one of similar duration is required for gas. All pertinent engineering, geologic, and economic data are required to support a claim that a well is capable of being produced in commercial quantities. Each test must be witnessed by the USGS although, with prior approval, an operator affidavit and third-party test results may be acceptable. When the District Supervisor determines that open hole evaluation data, such as wireline formation tests, drill stem tests, core data, and logs, have been demonstrated as reliable in a geologic area, such data may be considered as acceptable evidence that a well is capable of producing in paying quantities. The primary purpose of this Order is to provide for determinations of well productivity which may permit extensions of lease terms. Such extensions are frequently necessary to insure the orderly development of OCS oil and gas resources.

Gulf of Alska OCS Order No. 5

This Order sets forth requirements for the installation, design, testing, operation, and removal of subsurface safety devices. Due to the technical complexity of the Order, not all details are included in describing its mitigatory impact. In accordance with Section 21 of the OCSLAA of 1978, this Order requires the use of BAST. The lessee is encouraged to continue the development of safety-system technology. As research and product improvement results in increased effectiveness of existing safety equipment or the development of new equipment systems, such equipment may be used, and if such technologies provide a significant cost effective incremental benefit to safety, health, or the environment, shall be required to be used if determined to be BAST. Conformance to the standards, codes, and practices referenced in this Order, will be considered to be the application of BAST. Specific equipment, and procedures or systems not covered by standards, codes, or practices, will be analyzed to determine if the failure of such would have a significant effect on safety, health, or the environment. If such are identified, and until specific performance standards are developed or endorsed by the USGS, the lessee shall submit such information necessary to indicate the use of BAST, the alternatives considered to the specific equipment or procedures, and the rationale why one alternative technology was considered in place of another. This analysis shall include a discussion of the cost involved in the use of such technology and the incremental benefits gained.

This Order requires that Safety and Pollution-Prevention Equipment (SPPE) shall conform to the following quality assurance standards or subsequent revisions which the Chief, Conservation Division, USGS, has approved for use.

a. American National Standards Institute/American Society of Mechanical Engineers Standard "Quality Assurance and Certification of Safety and Pollution Preventional Equipment Used in Offshore Oil and Gas Operations", ANSI/ASME SPPE-1-1977, December 1977, (formerly ANSI/ASME-OCS-1-1977).

b. American National Standards Institute/American Society of Mechanical Engineers Standard "Accreditation of Testing Laboratories for Safety and Pollution Prevention Equipment Used in Offshore Oil and Gas Operations", ANSI/ASME-SPPE-2-1977, December 1977, (formerly ANSI/ASME-OCS-2-1977).

This Order requires that all well tubing installations, open to hydrocarbon-bearing zones, shall be equipped with a subsurface-safety device such as a Surface-Controlled Subsurface-Safety Valve (SCSSV), a Subsurface-Controlled Subsurface-Safety Valve (SSCSV), and injection valve, a tubing plug, or a tubular/annular subsurface-safety device unless, after application and justification, the well is determined to be incapable of flowing.

The lessee shall furnish evidence that the surface-controlled subsurface-safety devices and related equipment are capable of normal operation under subfreezing conditions. The surface controls may be located at a remote location.

These surface and subsurface safety valves, shall conform to "American Petroleum Institute (API) Specification for Subsurface-Safety Valves", API Spec 14A, Fourth Edition, November 1979, or subsequent revisions which the Chief, Conservation Division, has approved for use at the time of installation.

Testing or checking of these devices must be done at specified intervals. If a device does not operate correctly, it must be promptly removed and a properly operating device must be put in place and tested. Additionally, all tubing installations open to hydrocarbon-bearing zones and capable of flowing in which the subsurface-safety device has been removed, in accordance with the provisions of this Order, shall be identified by a sign on the wellhead stating that the subsurface-safety device has been removed. A subsurface-safety device shall be available for each well on the platform. In the event of an emergency, such as an impending storm, this device shall be properly installed as soon as possible with due consideration being given to personnel safety.

The subsurface-safety valves prescribed in this Order serve as a mechanism for automatically shutting in a well below the ocean floor in the event of an accident, or natural event, which destroys, or threatens to destroy, surface well control equipment. The reliability of such devices is

maximized through regular testing. As a result of these requirements, the probability of a producible well blowout is minimized.

Proposed Order No. 5 also sets forth requirements for the design, installation, operation, and testing of safety systems for platform production facilities. All new platforms resulting from this sale will have to be in conformance with API RP 14C, "Analysis, Design, Installation, and Testing of Basic Surface Safety Systems on Offshore Production Platforms."

Prior to the installation of platform equipment, the lessees must submit, for the District Supervisor's approval, schematic diagrams with equipment, pipeing, firefighting, electrical-system, gas-detection, and safety-shutdown specifications. A Safety Analysis Function Evaluation Chart must also be submitted. This chart relates all sensing devices, shutdown devices, and emergency-support systems to their functions. The chart provides a means of verifying the design logic of the basic safety system.

This Order requires additional safety and pollution control requirements which midify or are in addition to those contained in API RP 14C for operation of pressure vessels, flowlines, pressure senors, emergency shutdown systems, engine exhaust systems, glycol dehydration units, gas compressors, fire fighting systems, fire and gas detection systems, electrical equipment and erosion detection and measurement equipment.

Whenever operators plan to conduct activities simultaneously with production operations, which could increase the possibility of occurrence of an undesirable event, a "General Plan for Conducting Simultaneous Operations" in a producing field must be filed for the Supervisor's approval. Activities requiring the plan include drilling, workover, wireline, pumpdown, and major construction operations. The intent of this requirement is to permit USGS review of the conduct, control, and coordinations of the proposed operations. This review will determine whether the operations can be conducted simultaneously without significantly increasing the risk of accidents or spills.

Prior to welding or burning operations, lessees must submit a plan describing personnel requirements and designating safe weldig areas. Procedures for establishing safe welding areas, and for conducting operations outside such areas, are specified in this Order. The requirements reduce the potential for explosions, injuries, and pollution discharges.

This Order also requires the lessees to maintain records, for a minimum period of five years, for each surface-safety device installed. These records shall be available for review by any authorized representative of the USGS. The records shall show the present status and history of each device, including dates and details of installation, inspection, testing, repairing, adjustments, and re-installation.

As per USGS's Failure and Inventory Reporting System (FIRS), which applies to offshore structures, including satellites and jackets, which produce or

process hydrocarbons and includes the attendant portions of hydrocarbon pipelines, when physically located on the structure. When the devices specified are used as a part of the production safety and pollution prevention system, this Order requires the lessee to:

a. Submit an initial inventory of the safety and pollution prevention devices with periodic updates.

b. Report all device failures which occur.

To mitigate the potential for accidents resulting from human error, all personnel engaged in installing, inspecting, testing, and maintaining safety devices must meet specific training requirements. This Order also sets forth requirements for employee orientation and motivation programs concerned with safety and pollution prevention in offshore oil and gas operations.

Gulf of Alaska OCS Order No. 7

Order No. 7 relates to the prevention of pollution to the marine environment and provides rules for the disposal of waste materials generated as a result of offshore operations in a manner which will not "adversely affect the public health, life, property, aquatic life, wildlife, recreation, navigation, commercial fishing, or other uses of the ocean."

The operators must submit a list of drilling mud constituents, additives, and concentrations expected to be used; this provides a means to evaluate or alter the use and/or disposal of specific components which might be harmful to the environment. The disposal of drilling mud and drill cuttings, sand, and other well solids including those containing oil, is subject to the Environmental Protection Agency's permitting procedures, pursuant to the Federal Water Pollution Control Act, as amended. Approval of the method of drilling mud disposal into the ocean shall be obtained from the District Supervisor; each request will be decided on a case-by-case basis.

This Order requires that curbs, gutters, drip pans, and drains shall be installed in all deck areas in a manner necessary to collect all contaminants and to be piped to a properly designed, operated, and maintained sump system which will automatically maintain the oil at a level sufficient to prevent discharge of oil into OCS waters. Also, no solid waste materials or debris can be disposed of in the marine environment. Compliance with these requirements virtually eliminates the potential for adverse impacts on the biological communities, water quality, commercial fisheries, and offshore recreation, and also mitigates impacts along the coastline which would be caused by the washing of oil, fuel, chemical residues, or toxic substances to shore.

The disposal of equipment into the sea is prohibited, except under emergency conditions. The location and description of any equipment so discharged must be reported to the Supervisor. This requirement is intended to mitigate the potential for interference with commercial fishing operations.

All personnel must be thoroughly instructed in the prevention of pollution from offshore operations. Rigorous inspection schedules are required for all facilities. Pollution reports are required for all oil spills, and procedures are set forth for the notification of proper authorities. Pollution-control equipment must be maintained, or available, to each lessee. The equipment must include booms, skimmers, cleanup materials, and chemical agents. The equipment must be maintained and inspected monthly. (Chemical agents or additives for treatment of oil spills requires the consent of the Supervisor in accordance with Annex X, National Oil and Hazardous Substance Pollution Contingency Plan, and in accordance with the Memorandum of Understanding (MOU) between the Department of Transportation (U.S. Coast Guard) and the Department of Interior (U.S. Geological Survey), dated August 16, 1971).

This Order also sets forth requirements for pollution inspection of manned and unattended facilities on a daily basis or at intervals prescribed by the Supervisor, Also, it sets forth requirements for pollution reports.

Operators must submit an Oil Spill Contingency Plan for approval by the Supervisor before an application to conduct drilling operations may be approved. The plan must contain provisions for varying degrees of response effort depending on the severity of the oil spill; identification of available containment and cleanup equipment; notification of responsible persons and alternates in the event of a spill; identification of areas of special biological sensitivity; and specific actions to be taken after the discovery of an oil discharge. Should a spill occur, immediate corrective action must be taken.

Drilling and training classes for familiarization with pollution-control equipment and operational procedures must be conducted on a schedule approved by the Supervisor. The drills must include the deployment of equipment.

Although the emphasis of the OCS Orders is on the prevention of oil spills, it is recognized that spills will occur. It is also recognized that it is not tecnically possible to completely control and mechanically remove all oil that is discharged. The intent of this portion of the Order is to insure the operators have ready access to the best practical control equipment for the area, and for the prevailing conditions, and that personnel are trained to effectively utilize the equipment. The operator's plans must have sufficient flexibility to permit different spill-control strategies for different environmental conditions. This provides for mechanical and chemical measures which best compliment the forces of nature and maximize the protection of biological communities, shoreline resources, and commercial interests.

Gulf of Alaska OCS Order No. 8

This Order sets forth requirements for the design, installation, major modification and repairs, and verification of platforms and structures.

The Order specifies the procedures for the Platform Verification Program, as well as the requirements for verifying the structural integrity of the OCS platforms.

All structural plans must be certified by a registered professional structural engineer or a civil engineer specializing in structural design. Verification of the design, fabrication, installation, and modifications to offshore platforms and structures, will be done by a certified verification agent who is nominated by the lessee.

The Order requires submittal of the design plan to cover design documentation, general platform information, environmental and loading information, foundation and structural information, and the design verification.

For new platforms, or other structures, and for modifications which are subject to review under the requirements of the Platform Verification Program, the lessee shall submit a Fabrication Verification Plan for new platforms or other structures, and for modifications subject to review under the requirements of the Platform Verification Program, the lessee shall submit an Installation Verification Plan subsequent to the submittal of the Fabrication Verification Plan.

Order No. 8 also requires the lessee to compile, retain, and make available for review for the functional life of the platform or other structure that is subject to the provisions of this Order, the as-built structural drawings, the design assumptions and analysis, and a summary of the Non-Destructive Examinations records.

This Order assures careful review of platform design and minimizes the possability of spills and environmental damage resulting from structural failure.

Gulf of Alaska OCS Order No. 12

This Order sets forth requirements for the public availability of data and records concerning offshore petroleum operations. Under the Order, specific types of data and records pertaining to drilling and production operations, well tests, sale of lease production, accidents, inspections, and pollution incidents, are to be available for public inspection. Privileged information, such as certain geological and geophysical data, would be made available for public inspection with the lessee's consent or after a fixed period of time has elapsed. By making operations data available, this Order permits increased public awareness of OCS activities and involvement in OCS programs. Increased public interest and understanding should result in continuing improvements in the safety and pollution-prevention programs of both industry and Government.

APPENDIX D

USGS OILSPILL RISK ANALYSIS

Table 1. -- Oilspill probability estimates for spills greater than 1000 barrels resulting from OCS Lease Sale 60, from existing Federal leases, or from existing oil transportation in the Cook Inlet area.

	Expected number of spills (mean).	Most likely number of spills (mode).	Probability of one or more spills.
Sale 60	4.0	4	0.98
Existing leases	5.0	5	0.99
Sale 60 + existing	9.0	9	0.99+
Deletion alt. A	1.6	1	0.80
Del. alt. A + existing	6.6	6	0.99+
Deletion alt. B	1.3	1	0.71
Del. alt. B + existing	6.2	6	0.99+
Existing tankers	2.0	2	0.87
Sale 60, existing leases, and existing tankers	11.0	11	0.99+

Conditional

Table 2. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain target within 3 days.

	Hypothetical Spill Location																	
Target	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	T1	T2	T3
Land	55	38	47	51	35	25	44	64	47	42	46	34	13	12	45	62	57	50
Seabird, S., Apr-Sep	31	16	11	9	4	1	3	2	2	1	1	1	n	n	n	37	42	31
Seabird, S., Oct-Mar	47	35	31	16	10	7	11	9	9	5	4	1	1	n	n	45	44	44
Seabird, N., Apr-Sep	1	26	26	15	50	50	30	6	13	17	13	15	37	24	5	n	n	4
Seabird, N., Oct-Mar	n	16	12	3	50	50	26	n	9	17	12	19	41	22	6	n	n	n
Sea otter, area A	n	n	n	n	1	3	n	n	n	n	n	n	8	n	n	n	n	n
Sea otter, area B	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area C	n	3	16	6	12	4	5	1	1	1	n	n	1	n	n	n	n	1
Sea otter, area D	32	23	16	10	5	2	3	n	1	n	n	n	n	n	n	14	18	22
Sea otter, area E	1	2	6	5	2	1	2	1	2	1	1	n	n	1	1	7	8	2
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area G	n	n	n	n	1	6	n	n	n	n	n	n	17	1	n	n	n	n
Sea otter, area H	n	2	7	30	23	19	32	38	33	29	26	18	4	10	15	2	1	1
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	2	1
Rocky, All., Grassy	13	4	3	2	n	n	1	n	n	n	n	n	n	n	n	2	1	9
Dark, Sent., Latax	2	8	1	3	1	1	1	n	n	n	n	n	n	n	n	n	n	3
Barren Islands	n	5	18	7	15	6	6	2	3	1	n	n	1	n	n	n	n	1
Augustine Island	n	n	n	3	7	4	15	39	30	25	24	19	10	13	15	n	n	n
Kiukpalik, Shakun	2	1	5	3	1	n	n	1	1	n	n	n	n	n	n	11	10	3

Target	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
Land	41	31	23	32	35	27	42	10	16	39	53	64	38	27	63	8	4	5
Seabird, S., Apr-Sep	10	3	n	n	n	1	n	n	n	n	n	30	1	n	50	n	n	n
Seabird, S., Oct-Mar	29	10	1	1	2	4	1	n	n	n	n	34	9	n	50	n	n	n
Seabird, N., Apr-Sep	18	43	18	28	51	50	36	25	6	1	1	1	51	19	n	n	6	1
Seabird, N., Oct-Mar	8	42	19	35	50	51	37	27	8	1	1	n	50	29	n	n	8	2
Sea otter, area A	n	1	n	5	5	15	8	3	n	n	n	n	19	4	n	n	1	n
Sea otter, area B	n	n	n	n	5	1	n	n	n	n	n	n	n	n	n	n	3	n
Sea otter, area C	5	3	n	n	17	4	n	n	n	n	n	n	4	n	n	n	2	n
Sea otter, area D	16	2	n	n	2	1	n	n	n	n	n	57	2	n	32	n	1	4
Sea otter, area E	3	1	1	n	1	1	n	1	n	n	n	n	1	n	4	n	n	n
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area G	n	1	1	35	11	25	50	2	1	n	1	n	9	22	n	n	n	n
Sea otter, area H	10	22	14	4	13	7	2	5	2	1	1	n	16	2	n	n	n	n
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n
Rocky, All., Grassy	3	1	n	n	n	n	n	n	n	n	n	49	n	n	n	n	n	n
Dark, Sent., Latax	6	n	n	n	1	n	n	n	n	n	n	1	n	n	n	n	n	n
Barren Islands	6	4	n	n	28	5	n	n	n	n	n	n	7	n	n	n	3	1
Augustine Island	n	11	15	7	1	4	4	8	2	1	1	n	6	6	n	n	n	n
Kiukpalik, Shakun	3	n	n	n	1	n	n	n	n	n	n	1	1	n	6	n	n	n

Note: n = less than 0.5 percent.

Conditional

Table 3. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain target within 10 days.

Target	Hypothetical Spill Location																	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	T1	T2	T3
Land	90	85	89	88	85	86	90	95	91	92	93	91	81	86	93	94	94	90
Seabird, S., Apr-Sep	38	25	18	17	8	5	10	7	7	5	6	6	4	8	8	40	45	38
Seabird, S., Oct-Mar	50	40	39	23	18	19	17	17	20	15	16	14	14	17	13	46	45	47
Seabird, N., Apr-Sep	2	27	28	18	50	50	32	9	16	19	15	19	40	28	7	1	1	6
Seabird, N., Oct-Mar	n	16	12	4	50	50	27	2	11	17	13	20	43	27	8	n	n	n
Sea otter, area A	n	1	1	1	3	6	1	n	n	1	n	2	12	4	n	n	n	1
Sea otter, area B	n	3	1	1	3	2	2	1	1	1	n	1	1	1	n	n	n	n
Sea otter, area C	1	5	1/	9	18	7	10	4	6	6	4	4	4	2	3	n	n	1
Sea otter, area D	43	35	26	21	12	10	12	10	11	9	10	9	12	10	7	19	26	32
Sea otter, area E	7	6	8	8	4	2	4	3	4	3	2	3	2	4	2	11	10	7
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area G	n	n	n	n	2	11	1	n	n	n	1	2	19	2	n	n	n	n
Sea otter, area H	1	4	11	34	34	34	40	44	39	42	34	36	24	32	26	3	2	3
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	4	2	1	1	1	1	1	1	1	n	1	n	n	n	1	4	3	1
Rocky, All., Grassy	14	7	5	5	1	2	2	3	1	3	2	2	2	2	1	3	4	11
Dark, Sent., Latax	3	9	2	4	2	1	4	2	3	2	1	2	2	2	1	n	1	4
Barren Islands	1	7	20	11	20	9	11	4	8	9	5	4	5	4	3	n	n	2
Augustine Island	n	n	1	4	12	11	18	40	33	31	28	27	20	23	20	n	n	n
Kiukpalik, Shakun	9	5	8	5	2	3	3	2	3	1	1	1	2	2	1	15	14	8

Target	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
Land	88	88	88	88	78	90	88	85	79	83	89	92	89	86	94	18	20	17
Seabird, S., Apr-Sep	21	9	5	3	2	3	2	3	3	2	1	32	5	2	50	n	n	n
Seabird, S., Oct-Mar	36	23	18	12	9	18	11	16	11	5	6	36	22	10	50	n	n	n
Seabird, N., Apr-Sep	20	44	20	31	51	50	36	29	14	8	6	2	51	24	n	1	8	4
Seabird, N., Oct-Mar	8	43	20	37	50	52	38	32	19	11	8	1	50	32	n	3	11	6
Sea otter, area A	n	2	3	7	8	18	12	9	3	1	1	n	19	8	n	n	3	2
Sea otter, area B	1	1	n	n	12	2	1	1	n	n	n	1	2	n	n	1	13	5
Sea otter, area C	9	7	7	4	22	7	4	4	2	1	1	1	10	4	n	1	4	4
Sea otter, area D	30	11	7	8	9	11	5	7	4	4	2	63	12	6	37	2	2	5
Sea otter, area E	5	5	3	1	2	2	1	3	1	1	1	3	3	2	7	n	n	n
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Sea otter, area G	n	2	2	3/	12	27	52	6	5	1	2	n	9	23	n	n	n	n
Sea otter, area H	14	34	31	20	20	26	17	27	24	16	16	1	25	22	n	n	n	n
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	1	n	1	n	n	1	1	1	n	n	n	1	n	n	4	n	n	n
Rocky, All., Grassy	7	3	1	2	1	3	2	1	1	n	n	50	3	1	1	n	n	n
Dark, Sent., Latax	7	3	1	2	3	2	1	1	1	n	n	2	2	1	n	n	n	n
Barren Islands	10	8	7	5	32	9	4	5	3	1	1	1	12	5	n	1	5	5
Augustine Island	1	15	25	14	3	10	12	20	20	13	14	n	9	17	n	n	n	n
Kiukpalik, Shakun	9	2	3	1	2	1	1	2	1	n	n	4	3	1	10	n	n	n

Note: n = less than 0.5 percent.

Conditional

Table 4. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain target within 30 days.

	Hypothetical Spill Location																	
Target	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	T1	T2	T3
Land	99	96	97	98	98	99	99	99	99	99	99	99	99	99	**	**	99	99
Seabird, S., Apr-Sep	38	25	19	17	9	5	10	7	7	5	7	6	5	8	8	40	46	38
Seabird, S., Oct-Mar	50	40	39	23	19	19	17	17	20	15	16	15	16	18	13	46	45	47
Seabird, N., Apr-Sep	4	28	28	18	50	50	32	9	17	20	15	19	40	28	8	1	2	6
Seabird, N., Oct-Mar	n	16	12	4	50	50	27	2	11	17	13	20	44	27	8	n	n	n
Sea otter, area A	1	1	1	1	3	7	2	1	1	1	n	2	13	5	n	n	n	1
Sea otter, area B	1	4	2	2	6	4	3	1	2	2	1	1	2	2	1	n	n	1
Sea otter, area C	2	6	18	10	18	9	11	4	7	7	5	4	4	3	3	1	n	2
Sea otter, area D	44	36	26	22	13	11	13	10	11	10	11	10	16	12	8	20	27	33
Sea otter, area E	7	7	8	8	4	2	5	4	5	3	2	3	4	4	2	11	10	7
Sea otter, area F	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	1	n
Sea otter, area G	n	n	n	n	2	11	1	n	n	1	1	2	20	3	n	n	n	n
Sea otter, area H	1	5	12	34	34	36	40	44	39	42	35	37	25	34	27	3	2	3
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	4	2	1	1	1	1	1	1	1	n	1	n	n	1	1	4	3	1
Rocky, All., Grassy	14	7	5	5	1	2	2	3	1	3	2	2	3	2	1	3	4	12
Dark, Sent., Latax	4	9	3	4	2	2	4	2	3	2	1	2	3	2	1	1	1	4
Barren Islands	2	9	21	11	21	11	12	5	9	9	5	5	5	5	4	1	n	2
Augustine Island	n	1	1	4	12	11	18	40	33	31	28	27	21	24	21	n	n	n
Kiukpalik, Shakun	9	6	8	6	3	3	4	3	3	1	1	1	2	2	2	15	14	9

Target	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
Land	98	99	99	99	94	98	99	99	99	94	**	**	99	**	**	36	37	37
Seabird, S., Apr-Sep	22	9	5	3	2	3	3	4	4	2	1	32	5	3	50	n	n	n
Seabird, S., Oct-Mar	36	23	18	13	10	18	11	16	13	6	6	36	22	11	50	n	n	n
Seabird, N., Apr-Sep	20	44	21	31	51	50	36	30	14	8	8	3	51	24	1	4	9	6
Seabird, N., Oct-Mar	8	43	21	37	51	52	39	32	20	11	8	1	50	32	n	4	12	8
Sea otter, area A	1	4	4	7	9	19	15	11	4	1	3	1	20	9	n	1	4	3
Sea otter, area B	3	3	2	1	16	3	2	1	1	1	1	2	3	2	n	4	18	8
Sea otter, area C	9	8	8	4	22	8	4	6	3	2	2	1	10	4	n	3	5	6
Sea otter, area D	30	12	7	9	10	12	6	7	7	5	3	64	13	8	37	2	2	7
Sea otter, area E	6	5	4	2	2	3	2	4	2	1	1	3	4	2	7	n	n	n
Sea otter, area F	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	3	1	2
Sea otter, area G	n	2	3	38	12	27	52	7	6	1	3	n	9	24	n	n	n	n
Sea otter, area H	15	35	32	21	21	26	18	28	26	18	17	2	26	23	n	1	n	n
Red River salmon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Karluk River salmon	1	1	1	n	1	1	1	1	1	n	n	1	1	1	4	n	n	n
Rocky, All., Grassy	7	3	1	3	2	3	2	1	1	n	n	50	4	1	1	n	n	n
Dark, Sent., Latax	7	3	1	2	3	2	1	1	1	1	1	2	2	2	n	1	1	1
Barren Islands	11	9	8	5	33	10	5	7	4	2	2	1	12	5	n	4	6	7
Augustine Island	1	16	25	15	3	10	12	20	21	15	14	n	9	17	n	1	n	n
Kiukpalik, Shakun	9	2	3	1	2	2	1	3	2	n	1	5	3	2	10	n	n	n

Note: n = less than 0.5 percent.
** = greater than 99.5 percent.

Conditional

Table 5. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 3 days.

Land Segment	Hypothetical Spill Location																																	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
11	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n	n
12	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	6	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n
13	4	1	2	2	1	n	2	1	n	n	n	n	n	n	n	4	3	7	2	1	n	n	n	n	n	n	n	n	n	2	n	n	9	n	n	n
14	3	2	3	3	2	n	2	n	n	n	n	n	n	n	n	1	2	2	3	1	n	n	n	n	n	n	n	n	n	1	1	n	5	n	n	n
15	7	4	4	1	1	n	n	n	n	n	n	n	n	n	n	4	5	1	2	n	n	n	n	n	n	n	n	n	n	4	n	n	23	n	n	n
16	5	3	1	1	n	n	n	n	n	n	n	n	n	n	n	2	5	1	2	n	n	n	n	n	n	n	n	n	n	4	n	n	n	n	n	n
17	1/	9	4	4	n	1	n	n	n	n	n	n	n	n	n	3	1	12	5	n	n	n	1	n	n	n	n	n	n	45	1	n	n	n	n	n
18	n	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	1
20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1
21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n
24	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n
26	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n
27	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	n
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n
44	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	5	n	n
45	16	13	5	2	1	n	n	1	n	n	n	n	n	n	n	27	22	21	9	1	n	n	n	n	n	n	n	n	n	6	n	n	7	n	n
46	2	2	4	1	n	n	n	1	n	n	n	n	n	n	n	3	4	1	1	n	n	n	n	n	n	n	n	n	n	1	n	n	1	n	n
47	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n
48	1	n	2	n	n	n	1	n	1	n	n	n	n	n	n	6	5	1	1	n	n	n	n	n	n	n	n	n	n	1	n	n	4	n	n
49	1	1	3	2	2	n	n	n	n	n	n	n	n	n	n	4	4	1	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
50	n	n	2	7	2	n	1	1	n	1	n	1	n	n	n	n	n	n	4	1	n	n	2	n	n	n	n	n	n	n	1	n	n	n	n	n
51	n	n	n	2	1	n	n	n	n	1	n	n	n	n	n	n	n	n	1	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
53	n	1	3	15	6	4	2	1	1	2	1	n	n	n	n	n	n	n	3	6	n	n	7	1	n	n	n	n	n	n	3	n	n	n	n	n
54	n	n	n	4	7	11	16	3	8	12	6	3	3	1	1	n	n	n	2	8	3	2	3	4	1	2	n	n	n	n	7	1	n	n	n	n
55	n	n	n	n	n	n	n	3	1	n	1	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
56	n	n	n	2	4	2	9	29	21	13	15	12	1	7	11	n	n	n	n	5	11	1	n	1	1	2	2	n	1	n	2	1	n	n	n	n
57	n	n	n	n	n	n	1	2	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
58	n	n	n	n	1	n	3	21	3	1	3	3	n	n	5	n	n	n	n	1	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
59	n	n	n	n	n	n	2	n	8	2	5	1	n	n	4	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n
60	n	n	n	n	1	1	3	1	3	9	13	10	1	1	7	n	n	n	n	2	2	n	n	n	n	1	n	n	n	n	2	n	n	n	n	n
61	n	n	n	n	n	n	n	n	n	2	2	2	1	n	6	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
62	n	n	n	n	n	n	n	n	n	n	1	1	n	n	6	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
63	n	n	n	n	n	n	n	n	n	n	n	1	n	n	6	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
64	n	n	n	n	n	n	n	n	n	n	n	1	2	3	n	n	n	n	n	n	2	n	n	n	n	4	10	21	3	n	n	1	n	n	n	n
66	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n
67	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	6	n	n	n	n	n	n	n	n
69	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
70	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	1	n	n	n	1	3	7	22	n	n	1	n	n	n
71	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	20	n	n	1	n	n	n	n
72	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	1	n	n	1	n	1	1	n	n	2	n	n	n	n
73	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	5	n	n	2	n	n	n	n

Conditional

Table 6. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 10 days.

Land Segment	Hypothetical Spill Location																																	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
9	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n
10	1	1	n	n	n	n	n	1	n	n	1	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n
11	2	1	1	n	1	1	n	1	n	n	n	1	n	n	n	3	3	1	1	1	1	n	n	1	1	1	n	n	n	n	n	n	4	n	n	n
12	2	1	2	1	1	n	1	1	1	1	1	1	n	1	n	6	5	3	1	2	2	1	n	1	n	1	1	n	1	1	2	n	2	n	n	n
13	5	3	3	4	2	2	3	3	3	3	3	3	2	2	4	5	5	9	4	4	2	2	n	2	2	2	2	1	1	4	2	1	10	n	n	n
14	5	3	3	4	4	2	3	2	3	1	2	2	2	3	2	2	3	4	5	3	2	1	n	1	1	2	2	1	1	2	2	1	6	n	n	n
15	10	7	8	3	2	3	3	2	2	2	2	2	2	3	1	8	9	4	7	2	2	2	1	3	1	2	1	1	1	5	3	1	25	n	n	n
16	6	4	5	2	3	3	1	2	2	1	2	1	2	1	1	4	8	3	3	1	2	1	2	2	2	1	n	n	n	6	1	1	2	n	n	n
17	22	14	6	8	2	2	3	4	3	4	3	3	4	4	2	4	5	16	12	3	2	3	5	3	2	2	1	2	n	47	3	2	2	n	n	n
18	n	3	2	1	n	n	1	n	1	n	n	n	n	1	n	n	n	1	1	2	n	n	2	1	n	n	n	n	n	n	1	1	n	n	1	1
20	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n	1	n	n	n	n	n	n	n	n	n	n	n	1	1	1
21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2	2
22	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	2	2
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	n	n	n
24	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	n	n	n
26	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n
27	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1	1
29	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n
32	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n
38	n	n	n	n	1	n	n	n	1	n	n	n	n	n	n	2	1	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	1	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	1	n	n	1	n	n	n
40	1	1	1	n	1	n	n	1	n	n	1	1	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n
41	1	2	1	2	1	n	n	n	n	1	n	n	n	n	n	1	1	1	n	n	n	1	n	n	n	n	n	n	n	1	n	n	2	n	n	n
42	2	1	1	1	1	n	1	1	1	1	1	n	n	n	1	1	2	2	n	1	n	n	n	1	n	1	n	n	n	2	1	n	5	n	n	n
43	1	n	2	1	n	n	n	1	1	n	n	n	n	1	1	2	3	1	2	1	1	n	n	1	n	n	n	n	n	3	1	n	4	n	n	n
44	2	3	4	3	1	2	1	2	1	1	1	1	1	1	1	2	4	2	2	2	2	1	n	1	n	2	1	n	n	2	n	1	3	n	n	n
45	19	21	10	5	3	5	5	4	4	4	3	3	2	5	4	30	26	25	14	7	3	2	2	3	2	3	2	1	1	9	4	2	10	n	n	n
46	3	5	6	2	2	1	1	2	2	1	1	1	1	2	1	4	4	4	3	2	1	1	1	1	1	1	n	n	n	1	2	1	2	n	n	n
47	2	1	2	1	1	1	1	n	n	1	n	1	n	1	n	3	2	2	2	n	n	n	n	n	n	1	n	n	n	2	n	n	2	n	n	n
48	4	3	4	2	1	1	2	1	1	n	1	n	1	1	1	8	8	4	2	1	1	n	1	1	n	1	n	n	n	2	1	n	6	n	n	n
49	3	3	6	4	2	n	2	2	1	1	1	1	1	2	1	7	4	5	6	1	1	1	1	1	n	1	n	n	n	1	2	1	1	n	n	n
50	n	n	2	7	3	1	1	1	1	1	1	2	1	2	1	n	n	n	4	1	n	n	3	2	1	1	n	n	n	1	1	1	n	n	n	n
51	n	n	n	2	1	n	1	n	n	1	1	1	1	1	1	n	n	n	2	1	1	n	1	n	n	1	n	n	n	n	n	n	n	n	n	n
53	n	2	5	19	9	8	5	3	3	6	2	5	2	4	3	n	n	1	4	10	4	3	10	3	3	2	1	3	1	n	7	2	n	n	n	n
54	n	n	1	5	12	19	20	4	11	15	11	9	13	11	5	n	n	n	3	13	9	11	5	14	7	12	6	3	4	1	10	9	n	n	n	n
55	n	n	n	n	n	1	1	4	2	2	1	1	n	n	2	n	n	n	n	1	1	n	n	n	n	1	1	n	1	n	n	1	n	n	n	n
56	n	n	n	2	7	6	11	29	22	16	18	17	7	15	14	n	n	n	n	8	16	5	2	5	6	11	14	10	9	n	n	6	9	n	n	n
57	n	n	n	n	1	n	1	3	n	1	1	1	n	1	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
58	n	n	1	n	2	1	5	22	6	3	5	5	2	2	6	n	n	n	n	2	5	1	1	2	1	2	3	2	1	n	n	1	2	n	n	n
59	n	n	n	n	3	1	3	1	10	6	6	2	2	3	7	n	n	n	n	3	1	2	1	1	1	1	4	3	n	2	1	n	n	n	n	n
60	n	n	1	n	2	3	5	2	4	11	16	12	2	4	9	n	n	n	n	4	4	3	2	1	2	3	3	2	2	n	3	2	n	n	n	n
61	n	n	n	n	1	1	n	n	n	2	3	2	1	2	7	n	n	n	n	1	4	n	1	n	1	2	2	2	1	n	1	1	n	n	n	n
62	n	n	n	n	1	h	n	n	n	1	2	3	1	2	9	n	n	n	n	2	5	2	n	n	n	2	2	2	1	n	1	1	n	n	n	n
63	n	n	n	n	1	2	n	n	n	1	1	5	2	2	7	n	n	n	n	1	5	1	n	1	1	2	2	1	1	n	1	2	n	n	n	n
64	n	n	n	n	2	5	1	n	n	n	n	2	8	7	n	n	n	n	n	1	3	5	1	3	3	11	17	27	8	n	2	7	n	n	n	n

Conditional

Table 7. -- Probabilities (expressed in percent chance) that an oilspill starting at a particular location will contact a certain land segment within 30 days.

Land Segment	Hypothetical Spill Location																																		
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21
1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1
3	1	n	1	1	n	n	1	n	n	n	n	1	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n
4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1
7	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n
8	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	n	n	n
9	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	1	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n
10	1	1	n	1	n	n	n	1	n	1	1	n	n	n	n	1	1	n	n	1	1	n	n	n	n	n	n	n	n	1	n	n	1	n	n	n
11	2	1	1	n	1	1	n	1	1	n	1	1	n	1	n	4	4	1	1	1	1	1	1	1	1	1	1	n	n	n	n	1	4	n	n	n
12	3	2	2	1	1	n	1	1	1	2	2	1	n	1	n	6	5	3	2	2	2	1	1	1	n	1	1	n	1	1	2	n	2	n	n	n
13	5	3	3	4	2	2	3	3	4	3	3	3	2	2	4	6	5	9	4	4	2	3	n	2	2	2	2	1	1	4	2	1	10	n	n	n
14	5	3	3	5	4	2	3	2	3	1	2	2	4	3	2	2	3	4	5	3	2	1	n	1	1	2	3	2	1	2	3	1	6	n	n	n
15	10	7	8	3	2	3	3	2	2	2	3	2	2	3	1	9	9	4	7	3	2	2	1	4	1	2	2	1	2	6	4	2	26	n	n	n
16	7	4	5	3	3	3	1	2	2	2	2	1	3	1	2	4	8	3	3	1	2	1	2	2	2	1	1	n	n	6	1	2	2	n	n	n
17	23	14	6	9	2	2	4	4	3	4	4	4	5	5	2	5	5	17	13	3	2	3	5	4	2	2	1	2	n	48	4	2	2	1	n	1
18	n	3	2	1	1	n	1	n	1	n	n	n	1	1	n	n	n	1	1	2	n	n	2	1	n	n	1	n	n	n	1	1	n	1	1	1
20	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	1	n	n	n	n	n	n	n	n	1	n	n	n	1	1
21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	3
22	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	3
23	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	1	n
24	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	5	1	1
26	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1
27	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	1
28	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1
29	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	2
30	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1
32	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1
33	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1
34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	1	1
35	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1
36	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
38	n	1	n	n	1	n	n	n	1	n	n	n	n	n	n	2	1	n	n	1	n	n	n	1	n	n	n	n	n	1	1	n	1	n	n	n
39	1	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	1	1	1	n	n	n	1	1	n	n	n	n	n	n	n	n	1	n	n	n
40	2	1	1	1	1	n	1	1	1	n	1	1	n	n	n	1	1	2	1	n	n	1	n	n	n	n	1	n	n	n	1	n	2	n	n	n
41	1	2	1	2	1	1	n	n	n	1	n	1	n	1	n	1	2	2	n	1	n	n	n	1	1	1	1	n	n	2	1	n	5	n	n	n
42	2	1	1	1	1	n	1	1	1	1	1	1	n	1	1	1	1	2	1	1	2	n	n	1	n	n	1	n	n	3	1	1	4	n	n	n
43	1	n	2	1	1	n	n	1	1	n	n	1	n	1	2	2	3	1	2	2	1	n	n	1	1	n	n	1	1	2	n	1	4	n	n	n
44	2	3	4	3	1	2	2	2	1	1	1	1	2	1	1	2	4	2	2	2	2	2	1	1	1	1	1	2	n	5	1	1	7	n	n	n
45	20	21	10	6	3	6	5	4	4	4	3	3	2	6	4	30	26	26	15	7	3	2	2	4	2	3	3	1	1	9	4	3	10	n	n	n
46	3	5	6	3	3	2	2	2	2	1	2	1	1	3	1	4	4	4	3	2	1	1	1	1	1	2	1	n	1	1	2	1	3	n	n	n
47	2	1	3	1	1	1	1	n	1	1	n	1	n	1	1	3	2	3	3	n	n	n	n	n	n	1	1	n	n	2	1	1	2	n	n	n
48	4	3	4	2	1	1	2	2	1	n	1	1	1	1	1	9	8	4	3	1	1	1	1	1	n	2	1	1	1	3	1	1	6	n	n	n
49	3	4	6	5	3	n	2	2	1	1	1	2	3	2	1	7	5	5	6	2	1	2	1	1	n	2	1	n	n	1	2	1	1	n	n	n
50	n	n	2	7	3	2	2	1	1	2	1	2	1	2	1	n	n	n	4	2	n	n	3	2	1	1	1	1	1	n	1	1	n	n	n	n
51	n	n	n	2	1	n	1	n	n	1	1	1	1	1	1	n	n	n	2	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
53	n	2	5	19	9	8	5	3	3	6	2	5	2	4	4	n	n	1	4	10	4	3	10	3	3	2	1	3	1	n	7	2	n	n	n	n

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Final

Table 8. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the proposed lease area.

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	77	1	1.5	95	2	2.9	94	2	2.8	**	6	6.4	96	3	3.3	**	7	7.4
Seabird, S., Apr-Sep	49	0	0.7	54	0	0.8	54	0	0.8	66	1	1.1	55	0	0.8	67	1	1.1
Seabird, S., Oct-Mar	57	0	0.8	69	1	1.2	63	0	1.0	83	1	1.8	63	1	1.0	83	1	1.8
Seabird, N., Apr-Sep	35	0	0.4	84	1	1.8	38	0	0.5	86	1	1.9	40	0	0.5	86	1	2.0
Seabird, N., Oct-Mar	33	0	0.4	83	1	1.8	36	0	0.4	85	1	1.9	37	0	0.5	85	1	1.9
Sea otter, area A	3	0	0.0	12	0	0.1	5	0	0.1	20	0	0.2	8	0	0.1	26	0	0.3
Sea otter, area B	1	0	0.0	6	0	0.1	8	0	0.1	25	0	0.3	13	0	0.1	38	0	0.5
Sea otter, area C	5	0	0.1	22	0	0.3	11	0	0.1	39	0	0.5	14	0	0.2	44	0	0.6
Sea otter, area D	35	0	0.4	42	0	0.6	48	0	0.7	68	1	1.1	50	0	0.7	70	1	1.2
Sea otter, area E	8	0	0.1	12	0	0.1	17	0	0.2	27	0	0.3	17	0	0.2	29	0	0.3
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	4	0	0.0	5	0	0.0
Sea otter, area G	12	0	0.1	37	0	0.5	13	0	0.1	40	0	0.5	13	0	0.1	41	0	0.5
Sea otter, area H	22	0	0.2	60	0	0.9	33	0	0.4	77	1	1.5	35	0	0.4	79	1	1.5
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Karluk River salmon	3	0	0.0	3	0	0.0	6	0	0.1	7	0	0.1	6	0	0.1	9	0	0.1
Rocky, All., Grassy	6	0	0.1	7	0	0.1	10	0	0.1	17	0	0.2	10	0	0.1	18	0	0.2
Dark, Sent., Latax	3	0	0.0	4	0	0.0	6	0	0.1	14	0	0.1	7	0	0.1	16	0	0.2
Barren Islands	7	0	0.1	29	0	0.3	14	0	0.1	46	0	0.6	17	0	0.2	50	0	0.7
Augustine Island	11	0	0.1	41	0	0.5	16	0	0.2	53	0	0.7	17	0	0.2	54	0	0.8
Kiukpalik, Shakun	11	0	0.1	13	0	0.1	19	0	0.2	26	0	0.3	19	0	0.2	27	0	0.3

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Final

Table 9. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the proposed lease area, deletion alternative IV.

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	38	0	0.5	85	1	1.9	69	1	1.2	99	4	4.7	74	1	1.4	**	5	5.5
Seabird, S., Apr-Sep	5	0	0.1	15	0	0.2	12	0	0.1	34	0	0.4	12	0	0.1	35	0	0.4
Seabird, S., Oct-Mar	13	0	0.1	38	0	0.5	23	0	0.3	65	1	1.0	23	0	0.3	65	1	1.0
Seabird, N., Apr-Sep	34	0	0.4	84	1	1.8	36	0	0.4	85	1	1.9	36	0	0.4	85	1	1.9
Seabird, N., Oct-Mar	32	0	0.4	83	1	1.8	33	0	0.4	84	1	1.8	34	0	0.4	85	1	1.9
Sea otter, area A	3	0	0.0	12	0	0.1	5	0	0.0	19	0	0.2	6	0	0.1	25	0	0.3
Sea otter, area B	1	0	0.0	6	0	0.1	7	0	0.1	25	0	0.3	10	0	0.1	35	0	0.4
Sea otter, area C	5	0	0.1	22	0	0.3	10	0	0.1	38	0	0.5	11	0	0.1	42	0	0.5
Sea otter, area D	6	0	0.1	17	0	0.2	17	0	0.2	48	0	0.7	18	0	0.2	50	0	0.7
Sea otter, area E	2	0	0.0	6	0	0.1	5	0	0.1	18	0	0.2	6	0	0.1	19	0	0.2
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Sea otter, area G	10	0	0.1	36	0	0.4	11	0	0.1	39	0	0.5	11	0	0.1	40	0	0.5
Sea otter, area H	20	0	0.2	59	0	0.9	29	0	0.3	76	1	1.4	30	0	0.4	77	1	1.5
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Karluk River salmon	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0
Rocky, All., Grassy	1	0	0.0	3	0	0.0	4	0	0.0	12	0	0.1	4	0	0.0	12	0	0.1
Dark, Sent., Latax	2	0	0.0	4	0	0.0	4	0	0.0	12	0	0.1	4	0	0.0	14	0	0.1
Barren Islands	7	0	0.1	29	0	0.3	12	0	0.1	45	0	0.6	14	0	0.1	48	0	0.7
Augustine Island	9	0	0.1	40	0	0.5	13	0	0.1	51	0	0.7	14	0	0.1	52	0	0.7
Kiukpalik, Shakun	1	0	0.0	4	0	0.0	4	0	0.0	12	0	0.1	4	0	0.0	13	0	0.1

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Final

Table 10. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the proposed lease area, deletion alternative V.

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	32	0	0.4	83	1	1.8	59	0	0.9	99	4	4.5	65	1	1.0	99	5	5.2
Seabird, S., Apr-Sep	3	0	0.0	13	0	0.1	8	0	0.1	32	0	0.4	8	0	0.1	32	0	0.4
Seabird, S., Oct-Mar	6	0	0.1	35	0	0.4	17	0	0.2	61	0	1.0	17	0	0.2	62	0	1.0
Seabird, N., Apr-Sep	27	0	0.3	82	1	1.7	29	0	0.3	84	1	1.8	29	0	0.3	84	1	1.8
Seabird, N., Oct-Mar	26	0	0.3	81	1	1.7	27	0	0.3	83	1	1.8	28	0	0.3	83	1	1.8
Sea otter, area A	2	0	0.0	11	0	0.1	4	0	0.0	18	0	0.2	5	0	0.1	24	0	0.3
Sea otter, area B	1	0	0.0	5	0	0.1	5	0	0.1	23	0	0.3	8	0	0.1	33	0	0.4
Sea otter, area C	4	0	0.0	22	0	0.2	8	0	0.1	37	0	0.5	9	0	0.1	40	0	0.5
Sea otter, area D	3	0	0.0	14	0	0.2	11	0	0.1	44	0	0.6	12	0	0.1	47	0	0.6
Sea otter, area E	1	0	0.0	6	0	0.1	4	0	0.0	17	0	0.2	4	0	0.0	18	0	0.2
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Sea otter, area G	8	0	0.1	34	0	0.4	9	0	0.1	38	0	0.5	9	0	0.1	38	0	0.5
Sea otter, area H	18	0	0.2	58	0	0.9	26	0	0.3	75	1	1.4	26	0	0.3	76	1	1.4
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Karluk River salmon	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
Rocky, All., Grassy	1	0	0.0	2	0	0.0	3	0	0.0	10	0	0.1	3	0	0.0	11	0	0.1
Dark, Sent., Latax	1	0	0.0	3	0	0.0	3	0	0.0	11	0	0.1	3	0	0.0	12	0	0.1
Barren Islands	5	0	0.1	28	0	0.3	10	0	0.1	44	0	0.6	11	0	0.1	46	0	0.6
Augustine Island	9	0	0.1	39	0	0.5	12	0	0.1	50	0	0.7	12	0	0.1	51	0	0.7
Kiukpalik, Shakun	1	0	0.0	3	0	0.0	2	0	0.0	11	0	0.1	3	0	0.0	12	0	0.1

Note: n = less than 0.5 percent.

Final

Table 11. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the proposed lease area, transportation alternative A.

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	72	1	1.3	93	2	2.7	95	2	2.9	**	6	6.5	97	3	3.4	**	7	7.6
Seabird, S., Apr-Sep	28	0	0.3	36	0	0.4	39	0	0.5	55	0	0.8	39	0	0.5	55	0	0.8
Seabird, S., Oct-Mar	42	0	0.5	59	0	0.9	55	0	0.8	79	1	1.6	56	0	0.8	80	1	1.6
Seabird, N., Apr-Sep	51	0	0.7	88	2	2.1	55	0	0.8	90	2	2.3	56	0	0.8	90	2	2.3
Seabird, N., Oct-Mar	52	0	0.7	88	2	2.1	55	0	0.8	89	2	2.2	56	0	0.8	90	2	2.3
Sea otter, area A	7	0	0.1	15	0	0.2	12	0	0.1	25	0	0.3	15	0	0.2	32	0	0.4
Sea otter, area B	3	0	0.0	7	0	0.1	14	0	0.2	31	0	0.4	21	0	0.2	43	0	0.6
Sea otter, area C	8	0	0.1	25	0	0.3	17	0	0.2	44	0	0.6	20	0	0.2	48	0	0.6
Sea otter, area D	22	0	0.2	31	0	0.4	40	0	0.5	62	0	1.0	42	0	0.5	65	1	1.0
Sea otter, area E	6	0	0.1	10	0	0.1	15	0	0.2	26	0	0.3	16	0	0.2	28	0	0.3
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
Sea otter, area G	19	0	0.2	42	0	0.5	21	0	0.2	46	0	0.6	21	0	0.2	47	0	0.6
Sea otter, area H	28	0	0.3	63	1	1.0	47	0	0.6	82	1	1.7	49	0	0.7	83	1	1.8
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Karluk River salmon	1	0	0.0	1	0	0.0	4	0	0.0	5	0	0.1	4	0	0.0	7	0	0.1
Rocky, All., Grassy	6	0	0.1	8	0	0.1	11	0	0.1	18	0	0.2	11	0	0.1	19	0	0.2
Dark, Sent., Latax	4	0	0.0	5	0	0.1	8	0	0.1	16	0	0.2	9	0	0.1	18	0	0.2
Barren Islands	11	0	0.1	33	0	0.4	22	0	0.2	51	0	0.7	25	0	0.3	55	0	0.8
Augustine Island	16	0	0.2	44	0	0.6	27	0	0.3	59	0	0.9	27	0	0.3	60	0	0.9
Kiukpalik, Shakun	7	0	0.1	9	0	0.1	14	0	0.2	22	0	0.2	15	0	0.2	24	0	0.3

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Final

Table 12. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the proposed lease area, transportation alternative B.

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	72	1	1.3	93	2	2.7	94	2	2.8	**	6	6.4	96	3	3.3	**	7	7.4
Seabird, S., Apr-Sep	29	0	0.3	36	0	0.5	40	0	0.5	55	0	0.8	40	0	0.5	56	0	0.8
Seabird, S., Oct-Mar	45	0	0.6	61	0	0.9	57	0	0.8	80	1	1.6	57	0	0.8	80	1	1.6
Seabird, N., Apr-Sep	57	0	0.8	89	2	2.2	59	0	0.9	91	2	2.4	60	0	0.9	91	2	2.4
Seabird, N., Oct-Mar	54	0	0.8	88	2	2.2	57	0	0.8	90	2	2.3	57	0	0.9	90	2	2.3
Sea otter, area A	12	0	0.1	20	0	0.2	15	0	0.2	28	0	0.3	18	0	0.2	34	0	0.4
Sea otter, area B	4	0	0.0	8	0	0.1	18	0	0.2	33	0	0.4	25	0	0.3	46	0	0.6
Sea otter, area C	11	0	0.1	27	0	0.3	20	0	0.2	46	0	0.6	23	0	0.3	50	0	0.7
Sea otter, area D	23	0	0.3	32	0	0.4	41	0	0.5	63	0	1.0	43	0	0.6	66	1	1.1
Sea otter, area E	6	0	0.1	11	0	0.1	15	0	0.2	26	0	0.3	16	0	0.2	28	0	0.3
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
Sea otter, area G	7	0	0.1	33	0	0.4	8	0	0.1	37	0	0.5	8	0	0.1	38	0	0.5
Sea otter, area H	33	0	0.4	66	1	1.1	45	0	0.6	82	1	1.7	46	0	0.6	82	1	1.7
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Karluk River salmon	1	0	0.0	1	0	0.0	3	0	0.0	5	0	0.1	4	0	0.0	6	0	0.1
Rocky, All., Grassy	6	0	0.1	8	0	0.1	12	0	0.1	19	0	0.2	12	0	0.1	20	0	0.2
Dark, Sent., Latax	4	0	0.0	6	0	0.1	8	0	0.1	16	0	0.2	9	0	0.1	18	0	0.2
Barren Islands	16	0	0.2	36	0	0.4	26	0	0.3	54	0	0.8	28	0	0.3	57	0	0.8
Augustine Island	14	0	0.2	43	0	0.6	20	0	0.2	55	0	0.8	21	0	0.2	56	0	0.8
Kiukpalik, Shakun	7	0	0.1	10	0	0.1	15	0	0.2	22	0	0.3	16	0	0.2	24	0	0.3

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Final

Table 13. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the proposed lease area, transportation alternative C.

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	78	1	1.5	95	2	2.9	93	2	2.7	**	6	6.3	96	3	3.2	**	7	7.4
Seabird, S., Apr-Sep	47	0	0.6	53	0	0.7	55	0	0.8	66	1	1.1	55	0	0.8	67	1	1.1
Seabird, S., Oct-Mar	59	0	0.9	71	1	1.2	64	1	1.0	83	1	1.8	64	1	1.0	83	1	1.8
Seabird, N., Apr-Sep	21	0	0.2	81	1	1.6	28	0	0.3	83	1	1.8	31	0	0.4	84	1	1.8
Seabird, N., Oct-Mar	15	0	0.2	79	1	1.5	21	0	0.2	81	1	1.7	23	0	0.3	82	1	1.7
Sea otter, area A	n	0	0.0	9	0	0.1	3	0	0.0	18	0	0.2	6	0	0.1	24	0	0.3
Sea otter, area B	n	0	0.0	4	0	0.0	7	0	0.1	25	0	0.3	14	0	0.1	38	0	0.5
Sea otter, area C	4	0	0.0	21	0	0.2	12	0	0.1	40	0	0.5	16	0	0.2	45	0	0.6
Sea otter, area D	53	0	0.8	58	0	0.9	63	0	1.0	77	1	1.5	65	1	1.0	79	1	1.5
Sea otter, area E	6	0	0.1	10	0	0.1	15	0	0.2	26	0	0.3	16	0	0.2	28	0	0.3
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	4	0	0.0
Sea otter, area G	n	0	0.0	29	0	0.3	1	0	0.0	32	0	0.4	1	0	0.0	33	0	0.4
Sea otter, area H	17	0	0.2	58	0	0.9	25	0	0.3	75	1	1.4	26	0	0.3	76	1	1.4
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Karluk River salmon	2	0	0.0	2	0	0.0	4	0	0.0	6	0	0.1	4	0	0.0	7	0	0.1
Rocky, All., Grassy	35	0	0.4	36	0	0.4	38	0	0.5	43	0	0.6	38	0	0.5	44	0	0.6
Dark, Sent., Latax	5	0	0.0	6	0	0.1	8	0	0.1	16	0	0.2	9	0	0.1	18	0	0.2
Barren Islands	5	0	0.1	28	0	0.3	14	0	0.2	46	0	0.6	18	0	0.2	51	0	0.7
Augustine Island	7	0	0.1	38	0	0.5	9	0	0.1	49	0	0.7	9	0	0.1	50	0	0.7
Kiukpalik, Shakun	8	0	0.1	11	0	0.1	18	0	0.2	25	0	0.3	19	0	0.2	27	0	0.3

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

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Table 14. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the proposed lease area.

Land Segment	Within 3 days — Proposed			Within 3 days — Existing and Proposed			Within 10 days — Proposed			Within 10 days — Existing and Proposed			Within 30 days — Proposed			Within 30 days — Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
8	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
10	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	3	0	0.0
11	3	0	0.0	3	0	0.0	5	0	0.0	7	0	0.1	6	0	0.1	8	0	0.1
12	4	0	0.0	4	0	0.0	6	0	0.1	10	0	0.1	6	0	0.1	11	0	0.1
13	10	0	0.1	11	0	0.1	14	0	0.2	23	0	0.3	14	0	0.2	24	0	0.3
14	5	0	0.0	8	0	0.1	9	0	0.1	17	0	0.2	9	0	0.1	18	0	0.2
15	17	0	0.2	19	0	0.2	23	0	0.3	30	0	0.4	24	0	0.3	32	0	0.4
16	3	0	0.0	3	0	0.0	6	0	0.1	12	0	0.1	7	0	0.1	13	0	0.1
17	8	0	0.1	9	0	0.1	15	0	0.2	24	0	0.3	16	0	0.2	26	0	0.3
18	n	0	0.0	1	0	0.0	2	0	0.0	6	0	0.1	2	0	0.0	7	0	0.1
20	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0
21	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
22	1	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	2	0	0.0	3	0	0.0
23	2	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0	3	0	0.0	4	0	0.0
24	2	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0	4	0	0.0	5	0	0.0
26	1	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	2	0	0.0	2	0	0.0
27	1	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
29	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
32	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	3	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
37	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
38	n	0	0.0	n	0	0.0	2	0	0.0	3	0	0.0	2	0	0.0	4	0	0.0
39	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
40	n	0	0.0	n	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0	5	0	0.0
41	1	0	0.0	1	0	0.0	5	0	0.0	6	0	0.1	5	0	0.0	7	0	0.1
42	2	0	0.0	2	0	0.0	4	0	0.0	6	0	0.1	4	0	0.0	7	0	0.1
43	n	0	0.0	n	0	0.0	4	0	0.0	6	0	0.1	5	0	0.0	8	0	0.1
44	3	0	0.0	4	0	0.0	8	0	0.1	13	0	0.1	9	0	0.1	14	0	0.2
45	23	0	0.3	26	0	0.3	31	0	0.4	43	0	0.6	31	0	0.4	44	0	0.6
46	3	0	0.0	4	0	0.0	7	0	0.1	13	0	0.1	7	0	0.1	14	0	0.2
47	1	0	0.0	2	0	0.0	4	0	0.0	5	0	0.0	4	0	0.0	6	0	0.1

Table 15. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the proposed lease area, deletion alternative IV.

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
10	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
11	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
12	n	0	0.0	n	0	0.0	1	0	0.0	6	0	0.1	1	0	0.0	6	0	0.1
13	1	0	0.0	3	0	0.0	4	0	0.0	14	0	0.2	4	0	0.0	14	0	0.2
14	1	0	0.0	4	0	0.0	3	0	0.0	12	0	0.1	3	0	0.0	12	0	0.1
15	1	0	0.0	3	0	0.0	3	0	0.0	12	0	0.1	4	0	0.0	13	0	0.1
16	1	0	0.0	1	0	0.0	2	0	0.0	7	0	0.1	2	0	0.0	8	0	0.1
17	2	0	0.0	4	0	0.0	6	0	0.1	17	0	0.2	7	0	0.1	18	0	0.2
18	n	0	0.0	1	0	0.0	2	0	0.0	6	0	0.1	2	0	0.0	7	0	0.1
20	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0
22	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
29	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0
38	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0
39	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0
40	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0
41	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
42	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
43	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	5	0	0.0
44	n	0	0.0	1	0	0.0	2	0	0.0	7	0	0.1	2	0	0.0	8	0	0.1
45	3	0	0.0	6	0	0.1	8	0	0.1	24	0	0.3	8	0	0.1	24	0	0.3
46	n	0	0.0	2	0	0.0	2	0	0.0	8	0	0.1	2	0	0.0	9	0	0.1
47	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
48	n	0	0.0	1	0	0.0	1	0	0.0	5	0	0.0	2	0	0.0	6	0	0.1
49	1	0	0.0	3	0	0.0	2	0	0.0	8	0	0.1	3	0	0.0	11	0	0.1
50	2	0	0.0	5	0	0.0	3	0	0.0	8	0	0.1	3	0	0.0	8	0	0.1
51	1	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0
53	6	0	0.1	18	0	0.2	10	0	0.1	29	0	0.3	10	0	0.1	29	0	0.3
54	7	0	0.1	24	0	0.3	11	0	0.1	40	0	0.5	11	0	0.1	41	0	0.5

Final

Table 16. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the proposed lease area, deletion alternative V.

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
10	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0
11	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
12	n	0	0.0	n	0	0.0	1	0	0.0	5	0	0.1	1	0	0.0	6	0	0.1
13	1	0	0.0	2	0	0.0	3	0	0.0	13	0	0.1	3	0	0.0	14	0	0.2
14	1	0	0.0	4	0	0.0	2	0	0.0	11	0	0.1	2	0	0.0	11	0	0.1
15	n	0	0.0	3	0	0.0	2	0	0.0	11	0	0.1	2	0	0.0	12	0	0.1
16	n	0	0.0	1	0	0.0	1	0	0.0	7	0	0.1	1	0	0.0	7	0	0.1
17	1	0	0.0	2	0	0.0	4	0	0.0	15	0	0.2	4	0	0.0	16	0	0.2
18	n	0	0.0	1	0	0.0	1	0	0.0	5	0	0.0	1	0	0.0	6	0	0.1
20	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	2	0	0.0
22	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
29	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
38	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0
39	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0
40	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	2	0	0.0
41	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
42	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0
43	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	4	0	0.0
44	n	0	0.0	1	0	0.0	2	0	0.0	7	0	0.1	2	0	0.0	8	0	0.1
45	1	0	0.0	4	0	0.0	5	0	0.0	21	0	0.2	5	0	0.0	22	0	0.2
46	n	0	0.0	2	0	0.0	1	0	0.0	8	0	0.1	2	0	0.0	9	0	0.1
47	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0
48	n	0	0.0	1	0	0.0	1	0	0.0	4	0	0.0	1	0	0.0	5	0	0.0
49	1	0	0.0	3	0	0.0	2	0	0.0	8	0	0.1	2	0	0.0	10	0	0.1
50	2	0	0.0	5	0	0.0	2	0	0.0	7	0	0.1	2	0	0.0	8	0	0.1
51	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0
53	6	0	0.1	1/	0	0.2	8	0	0.1	28	0	0.3	8	0	0.1	28	0	0.3
54	6	0	0.1	24	0	0.3	10	0	0.1	39	0	0.5	10	0	0.1	39	0	0.5

Final

Table 17. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the proposed lease area, transportation alternative A.

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
8	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
10	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	3	0	0.0
11	1	0	0.0	1	0	0.0	3	0	0.0	4	0	0.0	3	0	0.0	6	0	0.1
12	2	0	0.0	3	0	0.0	5	0	0.1	10	0	0.1	6	0	0.1	10	0	0.1
13	5	0	0.0	6	0	0.1	9	0	0.1	19	0	0.2	10	0	0.1	20	0	0.2
14	3	0	0.0	6	0	0.1	7	0	0.1	15	0	0.2	8	0	0.1	16	0	0.2
15	4	0	0.0	6	0	0.1	11	0	0.1	19	0	0.2	12	0	0.1	21	0	0.2
16	3	0	0.0	3	0	0.0	7	0	0.1	12	0	0.1	7	0	0.1	13	0	0.1
17	9	0	0.1	10	0	0.1	17	0	0.2	26	0	0.3	18	0	0.2	28	0	0.3
18	n	0	0.0	1	0	0.0	3	0	0.0	7	0	0.1	4	0	0.0	8	0	0.1
20	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0
21	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
22	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
27	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
29	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
37	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
38	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
39	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
40	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
41	n	0	0.0	n	0	0.0	2	0	0.0	4	0	0.0	2	0	0.0	4	0	0.0
42	n	0	0.0	n	0	0.0	2	0	0.0	4	0	0.0	3	0	0.0	5	0	0.0
43	n	0	0.0	n	0	0.0	3	0	0.0	5	0	0.0	3	0	0.0	7	0	0.1
44	n	0	0.0	1	0	0.0	5	0	0.0	10	0	0.1	5	0	0.1	11	0	0.1
45	19	0	0.2	22	0	0.3	29	0	0.3	41	0	0.5	29	0	0.3	42	0	0.5
46	2	0	0.0	4	0	0.0	6	0	0.1	12	0	0.1	6	0	0.1	13	0	0.1
47	1	0	0.0	1	0	0.0	3	0	0.0	4	0	0.0	3	0	0.0	5	0	0.1
48	3	0	0.0	4	0	0.0	7	0	0.1	10	0	0.1	8	0	0.1	12	0	0.1
49	3	0	0.0	5	0	0.1	8	0	0.1	13	0	0.1	9	0	0.1	17	0	0.2

Table 18. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the proposed lease area, transportation alternative B.

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
8	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
10	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0
11	1	0	0.0	1	0	0.0	2	0	0.0	4	0	0.0	3	0	0.0	6	0	0.1
12	3	0	0.0	3	0	0.0	6	0	0.1	10	0	0.1	6	0	0.1	11	0	0.1
13	5	0	0.0	6	0	0.1	10	0	0.1	19	0	0.2	11	0	0.1	20	0	0.2
14	3	0	0.0	6	0	0.1	8	0	0.1	16	0	0.2	8	0	0.1	17	0	0.2
15	4	0	0.0	6	0	0.1	11	0	0.1	20	0	0.2	12	0	0.1	21	0	0.2
16	3	0	0.0	4	0	0.0	6	0	0.1	12	0	0.1	7	0	0.1	12	0	0.1
17	9	0	0.1	11	0	0.1	17	0	0.2	27	0	0.3	18	0	0.2	29	0	0.3
18	1	0	0.0	1	0	0.0	3	0	0.0	7	0	0.1	4	0	0.0	8	0	0.1
20	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	2	0	0.0
21	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
22	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
27	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
29	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
37	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
38	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	3	0	0.0
39	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
40	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0	4	0	0.0
41	n	0	0.0	n	0	0.0	2	0	0.0	4	0	0.0	3	0	0.0	4	0	0.0
42	n	0	0.0	n	0	0.0	2	0	0.0	4	0	0.0	2	0	0.0	5	0	0.0
43	n	0	0.0	n	0	0.0	3	0	0.0	5	0	0.0	3	0	0.0	7	0	0.1
44	n	0	0.0	1	0	0.0	5	0	0.0	10	0	0.1	5	0	0.0	11	0	0.1
45	19	0	0.2	22	0	0.3	29	0	0.3	41	0	0.5	29	0	0.3	42	0	0.5
46	2	0	0.0	4	0	0.0	7	0	0.1	13	0	0.1	7	0	0.1	14	0	0.2
47	1	0	0.0	1	0	0.0	3	0	0.0	4	0	0.0	3	0	0.0	5	0	0.1
48	3	0	0.0	4	0	0.0	7	0	0.1	10	0	0.1	7	0	0.1	11	0	0.1
49	3	0	0.0	6	0	0.1	8	0	0.1	14	0	0.2	9	0	0.1	17	0	0.2

Final

Table 19. -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the proposed lease area, transportation alternative C.

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
1	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
8	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
10	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	3	0	0.0
11	1	0	0.0	1	0	0.0	3	0	0.0	4	0	0.0	3	0	0.0	5	0	0.1
12	3	0	0.0	3	0	0.0	6	0	0.1	10	0	0.1	6	0	0.1	11	0	0.1
13	8	0	0.1	10	0	0.1	12	0	0.1	21	0	0.2	13	0	0.1	22	0	0.3
14	4	0	0.0	7	0	0.1	8	0	0.1	16	0	0.2	8	0	0.1	17	0	0.2
15	7	0	0.1	9	0	0.1	13	0	0.1	21	0	0.2	14	0	0.2	23	0	0.3
16	5	0	0.1	6	0	0.1	10	0	0.1	15	0	0.2	10	0	0.1	16	0	0.2
17	36	0	0.4	37	0	0.5	41	0	0.5	48	0	0.6	42	0	0.5	50	0	0.7
18	1	0	0.0	2	0	0.0	2	0	0.0	6	0	0.1	3	0	0.0	7	0	0.1
20	1	0	0.0	1	0	0.0	2	0	0.0	3	0	0.0	2	0	0.0	3	0	0.0
21	2	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0	4	0	0.0	4	0	0.0
22	1	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	4	0	0.0	4	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
26	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
27	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
29	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	3	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
32	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	2	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
37	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
38	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0	4	0	0.0
39	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0
40	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0	4	0	0.0
41	n	0	0.0	n	0	0.0	3	0	0.0	5	0	0.0	4	0	0.0	5	0	0.0
42	n	0	0.0	n	0	0.0	4	0	0.0	6	0	0.1	4	0	0.0	7	0	0.1
43	n	0	0.0	n	0	0.0	3	0	0.0	6	0	0.1	4	0	0.0	7	0	0.1
44	2	0	0.0	3	0	0.0	7	0	0.1	12	0	0.1	7	0	0.1	13	0	0.1
45	28	0	0.3	30	0	0.4	35	0	0.4	46	0	0.6	35	0	0.4	47	0	0.6
46	3	0	0.0	4	0	0.0	7	0	0.1	13	0	0.1	7	0	0.1	14	0	0.2

Table 20 -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the proposed lease area, existing leases, and existing tanker transportation (including upper Cook Inlet).

	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing, Proposed + tanker			Proposed			Existing, Proposed + tanker			Proposed			Existing, Proposed + tanker		
Target	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Land	77	1	1.5	97	3	3.6	94	2	2.8	**	9	9.2	96	3	3.3	**	10	10.9
Seabird, S., Apr-Sep	49	0	0.7	54	0	0.8	54	0	0.8	69	1	1.2	55	0	0.8	70	1	1.2
Seabird, S., Oct-Mar	57	0	0.8	70	1	1.2	63	0	1.0	88	2	2.2	63	1	1.0	89	2	2.2
Seabird, N., Apr-Sep	35	0	0.4	93	2	2.7	38	0	0.5	95	2	2.9	40	0	0.5	95	2	3.0
Seabird, N., Oct-Mar	33	0	0.4	93	2	2.7	36	0	0.4	95	3	3.0	37	0	0.5	95	3	3.1
Sea otter, area A	3	0	0.0	22	0	0.3	5	0	0.1	38	0	0.5	8	0	0.1	46	0	0.6
Sea otter, area B	1	0	0.0	11	0	0.1	8	0	0.1	41	0	0.5	13	0	0.1	55	0	0.8
Sea otter, area C	5	0	0.1	28	0	0.3	11	0	0.1	50	0	0.7	14	0	0.2	56	0	0.8
Sea otter, area D	35	0	0.4	43	0	0.6	48	0	0.7	74	1	1.3	50	0	0.7	77	1	1.5
Sea otter, area E	8	0	0.1	13	0	0.1	17	0	0.2	31	0	0.4	17	0	0.2	35	0	0.4
Sea otter, area F	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	4	0	0.0	6	0	0.1
Sea otter, area G	12	0	0.1	58	0	0.9	13	0	0.1	64	1	1.0	13	0	0.1	65	1	1.1
Sea otter, area H	22	0	0.2	65	1	1.0	33	0	0.4	89	2	2.2	35	0	0.4	90	2	2.3
Red River salmon	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
Karluk River salmon	3	0	0.0	3	0	0.0	6	0	0.1	9	0	0.1	6	0	0.1	10	0	0.1
Rocky, All., Grassy	6	0	0.1	7	0	0.1	10	0	0.1	20	0	0.2	10	0	0.1	22	0	0.2
Dark, Sent., Latax	3	0	0.0	5	0	0.0	6	0	0.1	17	0	0.2	7	0	0.1	20	0	0.2
Barren Islands	7	0	0.1	36	0	0.4	14	0	0.1	58	0	0.9	17	0	0.2	64	1	1.0
Augustine Island	11	0	0.1	50	0	0.7	16	0	0.2	71	1	1.2	17	0	0.2	72	1	1.3
Kiukpalik, Shakun	11	0	0.1	14	0	0.1	19	0	0.2	28	0	0.3	19	0	0.2	31	0	0.4

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

Final

Table 21 -- Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the proposed lease area, compared with total risks from the proposed leases, existing leases, and existing tanker transportation.(including upper Cook Inlet).

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing, Proposed + tanker			Proposed			Existing, Proposed + tanker			Proposed			Existing, Proposed + tanker		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
3	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
4	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0
7	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
8	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
9	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0
10	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	3	0	0.0
11	3	0	0.0	3	0	0.0	5	0	0.0	8	0	0.1	6	0	0.1	10	0	0.1
12	4	0	0.0	4	0	0.0	6	0	0.1	12	0	0.1	6	0	0.1	13	0	0.1
13	10	0	0.1	11	0	0.1	14	0	0.2	27	0	0.3	14	0	0.2	28	0	0.3
14	5	0	0.0	8	0	0.1	9	0	0.1	21	0	0.2	9	0	0.1	22	0	0.2
15	17	0	0.2	19	0	0.2	23	0	0.3	33	0	0.4	24	0	0.3	35	0	0.4
16	3	0	0.0	4	0	0.0	6	0	0.1	14	0	0.2	7	0	0.1	15	0	0.2
17	8	0	0.1	9	0	0.1	15	0	0.2	29	0	0.3	16	0	0.2	31	0	0.4
18	n	0	0.0	1	0	0.0	2	0	0.0	8	0	0.1	2	0	0.0	10	0	0.1
20	n	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0
21	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0
22	1	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	2	0	0.0	3	0	0.0
23	2	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0	3	0	0.0	5	0	0.0
24	2	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0	4	0	0.0	6	0	0.1
26	1	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	2	0	0.0	2	0	0.0
27	1	0	0.0	1	0	0.0	2	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0
28	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
29	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
30	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	4	0	0.0
32	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0
33	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0
34	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	4	0	0.0
35	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0
37	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
38	n	0	0.0	n	0	0.0	2	0	0.0	3	0	0.0	2	0	0.0	4	0	0.0
39	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0
40	n	0	0.0	n	0	0.0	2	0	0.0	4	0	0.0	3	0	0.0	6	0	0.1
41	1	0	0.0	1	0	0.0	5	0	0.0	7	0	0.1	5	0	0.0	8	0	0.1
42	2	0	0.0	2	0	0.0	4	0	0.0	7	0	0.1	4	0	0.0	8	0	0.1
43	n	0	0.0	n	0	0.0	4	0	0.0	7	0	0.1	5	0	0.0	9	0	0.1
44	3	0	0.0	4	0	0.0	8	0	0.1	15	0	0.2	9	0	0.1	16	0	0.2
45	23	0	0.3	26	0	0.3	31	0	0.4	47	0	0.6	31	0	0.4	48	0	0.6

46	3	0	0.0	4	0	0.0	7	0	0.1	15	0	0.2	7	0	0.1	17	0	0.2
47	1	0	0.0	2	0	0.0	4	0	0.0	6	0	0.1	4	0	0.0	7	0	0.1
48	6	0	0.1	7	0	0.1	11	0	0.1	15	0	0.2	11	0	0.1	17	0	0.2
49	3	0	0.0	5	0	0.1	7	0	0.1	14	0	0.2	8	0	0.1	19	0	0.2
50	2	0	0.0	5	0	0.0	3	0	0.0	10	0	0.1	3	0	0.0	11	0	0.1
51	1	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0
53	6	0	0.1	19	0	0.2	10	0	0.1	34	0	0.4	10	0	0.1	34	0	0.4
54	6	0	0.1	28	0	0.3	12	0	0.1	55	0	0.8	12	0	0.1	56	0	0.8
55	n	0	0.0	1	0	0.0	1	0	0.0	4	0	0.0	1	0	0.0	4	0	0.0
56	6	0	0.1	28	0	0.3	9	0	0.1	49	0	0.7	10	0	0.1	51	0	0.7
57	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	4	0	0.0
58	2	0	0.0	5	0	0.0	3	0	0.0	16	0	0.2	4	0	0.0	19	0	0.2
59	1	0	0.0	7	0	0.1	2	0	0.0	17	0	0.2	3	0	0.0	19	0	0.2
60	2	0	0.0	9	0	0.1	4	0	0.0	21	0	0.2	4	0	0.0	23	0	0.3
61	1	0	0.0	2	0	0.0	1	0	0.0	8	0	0.1	1	0	0.0	9	0	0.1
62	1	0	0.0	1	0	0.0	2	0	0.0	10	0	0.1	2	0	0.0	10	0	0.1
63	1	0	0.0	1	0	0.0	1	0	0.0	8	0	0.1	1	0	0.0	9	0	0.1
64	n	0	0.0	11	0	0.1	2	0	0.0	30	0	0.4	3	0	0.0	32	0	0.4
65	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	2	0	0.0
66	n	0	0.0	n	0	0.0	1	0	0.0	5	0	0.0	1	0	0.0	6	0	0.1
67	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0
69	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	1	0	0.0
70	n	0	0.0	4	0	0.0	1	0	0.0	10	0	0.1	1	0	0.0	10	0	0.1
72	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0
73	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
74	n	0	0.0	3	0	0.0	1	0	0.0	5	0	0.0	1	0	0.0	6	0	0.1
75	7	0	0.1	40	0	0.5	8	0	0.1	45	0	0.6	8	0	0.1	46	0	0.6
76	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0
77	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	2	0	0.0
78	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	4	0	0.0
79	1	0	0.0	8	0	0.1	3	0	0.0	22	0	0.3	3	0	0.0	26	0	0.3
80	1	0	0.0	9	0	0.1	3	0	0.0	20	0	0.2	5	0	0.0	25	0	0.3
81	3	0	0.0	11	0	0.1	6	0	0.1	28	0	0.3	8	0	0.1	34	0	0.4
82	1	0	0.0	8	0	0.1	2	0	0.0	14	0	0.2	3	0	0.0	17	0	0.2
83	n	0	0.0	2	0	0.0	2	0	0.0	14	0	0.2	4	0	0.0	19	0	0.2
84	n	0	0.0	2	0	0.0	1	0	0.0	9	0	0.1	3	0	0.0	14	0	0.2
85	n	0	0.0	1	0	0.0	1	0	0.0	7	0	0.1	2	0	0.0	10	0	0.1
86	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	9	0	0.1
87	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	3	0	0.0
88	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0
89	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0
90	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
91	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0
92	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0
93	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0
94	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0

Note: n = less than 0.5 percent. Those land segments for which all probabilities are less than 0.5 percent are not shown.

Table 22 -- Final probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the existing leases.

	3 DAYS			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
EABIRD FORAGING AREA SOUTH APRIL-SEPTEMBER	76	1	1.4	97	3	3.6	98	4	4.2
EABIRD FORAGING AREA SOUTH OCTOBER-MARCH	10	0	0.1	25	0	0.3	26	0	0.3
EABIRD FORAGING AREA NORTH APRIL-SEPTEMBER	29	0	0.3	54	0	0.8	54	0	0.8
EABIRD FORAGING AREA NORTH OCTOBER-MARCH	75	1	1.4	77	1	1.5	77	1	1.5
EA OTTER CONCENTRATION AREA A	75	1	1.4	76	1	1.4	77	1	1.5
EA OTTER CONCENTRATION AREA B	9	0	0.1	15	0	0.2	19	0	0.2
EA OTTER CONCENTRATION AREA C	0	0	0.0	19	0	0.2	28	0	0.3
EA OTTER CONCENTRATION AREA D	18	0	0.2	32	0	0.4	35	0	0.4
EA OTTER CONCENTRATION AREA E	12	0	0.1	37	0	0.5	39	0	0.5
EA OTTER CONCENTRATION AREA F	5	0	0.0	13	0	0.1	14	0	0.2
EA OTTER CONCENTRATION AREA G	0	0	0.0	0	0	0.0	1	0	0.0
EA OTTER CONCENTRATION AREA H	29	0	0.3	31	0	0.4	32	0	0.4
ED RIVER SALMON SCHOOLING AREA	49	0	0.7	66	1	1.1	67	1	1.1
ARLUK RIVER SALMON SCHOOLING AREA	0	0	0.0	0	0	0.0	0	0	0.0
OCKY, ALLIGATOR, AND GRASSY ISLANDS AREA	0	0	0.0	2	0	0.0	3	0	0.0
ARK, SENTINEL ISLANDS, AND LATAX ROCKS AREA	2	0	0.0	8	0	0.1	9	0	0.1
ARREN ISLANDS AREA	2	0	0.0	9	0	0.1	10	0	0.1
UGUSTINE ISLAND AREA	24	0	0.3	38	0	0.5	40	0	0.5
IUKPALIK, SHAKUN ISLANDS, AND SHAKUN ROCK AREA	33	0	0.4	44	0	0.6	45	0	0.6
	3	0	0.0	9	0	0.1	10	0	0.1

Table 23 -- Final probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the existing tanker transportation (including upper Cook Inlet).

							30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
AND	50	0	0.7	94	2	2.8	97	3	3.5
EABIRD FORAGING AREA SOUTH APRIL-SEPTEMBER	0	0	0.0	8	0	0.1	10	0	0.1
EABIRD FORAGING AREA SOUTH OCTOBER-MARCH	1	0	0.0	32	0	0.4	34	0	0.4
EABIRD FORAGING AREA NORTH APRIL-SEPTEMBER	57	0	0.8	63	0	1.0	64	1	1.0
EABIRD FORAGING AREA NORTH OCTOBER-MARCH	61	0	0.9	68	1	1.1	69	1	1.2
EA OTTER CONCENTRATION AREA A	12	0	0.1	23	0	0.3	27	0	0.3
EA OTTER CONCENTRATION AREA B	5	0	0.1	21	0	0.2	28	0	0.3
EA OTTER CONCENTRATION AREA C	7	0	0.1	18	0	0.2	22	0	0.2
EA OTTER CONCENTRATION AREA D	1	0	0.0	20	0	0.2	23	0	0.3
EA OTTER CONCENTRATION AREA E	1	0	0.0	6	0	0.1	8	0	0.1
EA OTTER CONCENTRATION AREA F	0	0	0.0	0	0	0.0	1	0	0.0
EA OTTER CONCENTRATION AREA G	34	0	0.4	39	0	0.5	41	0	0.5
EA OTTER CONCENTRATION AREA H	13	0	0.1	50	0	0.7	52	0	0.7
ED RIVER SALMON SCHOOLING AREA	0	0	0.0	0	0	0.0	0	0	0.0
ARLUK RIVER SALMON SCHOOLING AREA	0	0	0.0	1	0	0.0	2	0	0.0
OCKY, ALLIGATOR, AND GRASSY ISLANDS AREA	0	0	0.0	4	0	0.0	4	0	0.0
ARK, SENTINEL ISLANDS, AND LATAX ROCKS AREA	1	0	0.0	4	0	0.0	5	0	0.0
ARREN ISLANDS AREA	10	0	0.1	23	0	0.3	28	0	0.3
UGUSTINE ISLAND AREA	15	0	0.2	38	0	0.5	39	0	0.5
IUKPALIK, SHAKUN ISLANDS, AND SHAKUN ROCK AREA	0	0	0.0	3	0	0.0	5	0	0.1

Table 24 -- Final probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of the existing leases and existing tankering (including upper Cook Inlet).

SEGMENT	3 ~~DAYS~~			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	1	0	0.01
4	0	0	0.0	0	0	0.0	1	0	0.01
5	0	0	0.0	0	0	0.0	0	0	0.0
6	0	0	0.0	0	0	0.0	0	0	0.00
7	0	0	0.0	0	0	0.0	0	0	0.00
8	0	0	0.0	0	0	0.0	0	0	0.00
9	0	0	0.0	0	0	0.0	1	0	0.01
10	0	0	0.0	0	0	0.00	1	0	0.01
11	0	0	0.0	2	0	0.02	3	0	0.03
12	0	0	0.00	4	0	0.04	5	0	0.05
13	2	0	0.02	10	0	0.11	11	0	0.12
14	3	0	0.03	9	0	0.09	9	0	0.10
15	2	0	0.02	9	0	0.10	10	0	0.11
16	1	0	0.01	6	0	0.06	6	0	0.07
17	2	0	0.02	12	0	0.12	13	0	0.14
18	1	0	0.01	4	0	0.04	5	0	0.05
19	0	0	0.0	0	0	0.00	0	0	0.00
20	0	0	0.00	1	0	0.01	1	0	0.01
21	0	0	0.0	0	0	0.0	0	0	0.00
22	0	0	0.0	0	0	0.00	1	0	0.01
23	0	0	0.0	0	0	0.0	1	0	0.01
24	0	0	0.0	0	0	0.0	1	0	0.01
25	0	0	0.0	0	0	0.0	0	0	0.0
26	0	0	0.0	0	0	0.0	0	0	0.00
27	0	0	0.0	0	0	0.0	0	0	0.00
28	0	0	0.0	0	0	0.0	1	0	0.01
29	0	0	0.0	1	0	0.01	1	0	0.01
30	0	0	0.0	0	0	0.0	1	0	0.01
31	0	0	0.0	0	0	0.0	0	0	0.0
32	0	0	0.0	0	0	0.0	0	0	0.0
33	0	0	0.0	0	0	0.0	1	0	0.01
34	0	0	0.0	0	0	0.00	1	0	0.01
35	0	0	0.0	0	0	0.00	1	0	0.01
36	0	0	0.0	0	0	0.0	0	0	0.00
37	0	0	0.0	0	0	0.0	0	0	0.00
38	0	0	0.0	1	0	0.01	2	0	0.02
39	0	0	0.0	0	0	0.00	1	0	0.01
40	0	0	0.0	1	0	0.01	2	0	0.02
41	0	0	0.0	1	0	0.01	2	0	0.02
42	0	0	0.0	2	0	0.02	2	0	0.02
43	0	0	0.0	3	0	0.03	4	0	0.04
44	0	0	0.00	5	0	0.05	6	0	0.06
45	4	0	0.04	17	0	0.19	18	0	0.19
46	2	0	0.02	6	0	0.07	7	0	0.07
47	0	0	0.00	1	0	0.01	2	0	0.02
48	1	0	0.01	3	0	0.03	4	0	0.04
49	2	0	0.02	6	0	0.06	8	0	0.09
50	3	0	0.03	5	0	0.05	5	0	0.06
51	1	0	0.01	2	0	0.02	2	0	0.02
52	0	0	0.0	0	0	0.00	0	0	0.00
53	13	0	0.13	21	0	0.24	21	0	0.24
54	19	0	0.21	32	0	0.39	33	0	0.40
55	0	0	0.00	2	0	0.02	2	0	0.02
56	19	0	0.22	27	0	0.32	28	0	0.33
57	0	0	0.00	1	0	0.01	1	0	0.01
58	3	0	0.03	8	0	0.09	9	0	0.10
59	6	0	0.06	11	0	0.12	11	0	0.12
60	7	0	0.07	12	0	0.12	12	0	0.13
61	1	0	0.01	3	0	0.03	3	0	0.03
62	0	0	0.00	4	0	0.04	4	0	0.04
63	0	0	0.00	3	0	0.03	3	0	0.03
64	0	0	0.00	6	0	0.06	7	0	0.07

65	0	0	0.0	1	0	0.01	1	0	0.01
66	0	0	0.0	1	0	0.01	2	0	0.02
67	0	0	0.0	0	0	0.00	0	0	0.00
68	0	0	0.0	0	0	0.0	0	0	0.0
69	0	0	0.0	0	0	0.00	0	0	0.00
70	0	0	0.00	2	0	0.02	2	0	0.02
71	0	0	0.0	0	0	0.00	0	0	0.00
72	1	0	0.01	1	0	0.01	1	0	0.01
73	0	0	0.00	1	0	0.01	1	0	0.01
74	1	0	0.01	2	0	0.02	2	0	0.02
75	18	0	0.19	20	0	0.22	20	0	0.23
76	0	0	0.00	1	0	0.01	1	0	0.01
77	0	0	0.00	0	0	0.00	1	0	0.01
78	0	0	0.00	1	0	0.01	2	0	0.02
79	3	0	0.03	7	0	0.08	9	0	0.10
80	4	0	0.04	8	0	0.09	11	0	0.12
81	7	0	0.08	17	0	0.18	19	0	0.21
82	5	0	0.05	9	0	0.09	10	0	0.10
83	1	0	0.01	6	0	0.07	8	0	0.08
84	1	0	0.01	4	0	0.04	6	0	0.07
85	0	0	0.00	2	0	0.02	4	0	0.04
86	0	0	0.0	1	0	0.01	4	0	0.04
87	0	0	0.0	1	0	0.01	1	0	0.01
88	0	0	0.0	0	0	0.00	1	0	0.01
89	0	0	0.0	0	0	0.0	1	0	0.01
90	0	0	0.0	0	0	0.0	0	0	0.00
91	0	0	0.0	0	0	0.0	1	0	0.01
92	0	0	0.0	0	0	0.0	1	0	0.01
93	0	0	0.0	0	0	0.0	1	0	0.01
94	0	0	0.0	0	0	0.0	1	0	0.01
95	0	0	0.0	0	0	0.0	0	0	0.0
96	0	0	0.0	0	0	0.0	0	0	0.0

Table 25 -- Final probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of the existing tankering in upper Cook Inlet.

SEGMENT	3 DAYS			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	0	0	0.00
4	0	0	0.0	0	0	0.0	1	0	0.01
5	0	0	0.0	0	0	0.0	0	0	0.0
6	0	0	0.0	0	0	0.0	0	0	0.0
7	0	0	0.0	0	0	0.0	0	0	0.00
8	0	0	0.0	0	0	0.0	0	0	0.00
9	0	0	0.0	0	0	0.0	0	0	0.00
10	0	0	0.0	0	0	0.00	0	0	0.00
11	0	0	0.0	1	0	0.01	2	0	0.02
12	0	0	0.0	2	0	0.02	3	0	0.03
13	0	0	0.0	5	0	0.05	6	0	0.06
14	0	0	0.0	4	0	0.04	5	0	0.05
15	0	0	0.0	4	0	0.05	5	0	0.05
16	0	0	0.00	2	0	0.02	3	0	0.03
17	0	0	0.00	5	0	0.06	7	0	0.07
18	0	0	0.00	2	0	0.02	3	0	0.03
19	0	0	0.0	0	0	0.0	0	0	0.0
20	0	0	0.00	1	0	0.01	1	0	0.01
21	0	0	0.0	0	0	0.0	0	0	0.00
22	0	0	0.0	0	0	0.0	1	0	0.01
23	0	0	0.0	0	0	0.0	1	0	0.01
24	0	0	0.0	0	0	0.0	1	0	0.01
25	0	0	0.0	0	0	0.0	0	0	0.0
26	0	0	0.0	0	0	0.0	0	0	0.0
27	0	0	0.0	0	0	0.0	0	0	0.00
28	0	0	0.0	0	0	0.0	1	0	0.01
29	0	0	0.0	1	0	0.01	1	0	0.01
30	0	0	0.0	0	0	0.0	2	0	0.02
31	0	0	0.0	0	0	0.0	0	0	0.0
32	0	0	0.0	0	0	0.0	0	0	0.0

53	0	0	0.0	0	0	0.0	1	0	0.01
54	0	0	0.0	0	0	0.00	1	0	0.01
55	0	0	0.0	0	0	0.00	1	0	0.01
56	0	0	0.0	0	0	0.0	0	0	0.00
57	0	0	0.0	0	0	0.0	0	0	0.0
58	0	0	0.0	0	0	0.00	0	0	0.00
59	0	0	0.0	0	0	0.00	0	0	0.00
60	0	0	0.0	1	0	0.01	1	0	0.01
61	0	0	0.0	1	0	0.01	1	0	0.01
62	0	0	0.0	1	0	0.01	1	0	0.01
63	0	0	0.0	0	0	0.00	1	0	0.01
64	0	0	0.0	2	0	0.02	3	0	0.03
65	0	0	0.0	7	0	0.07	8	0	0.08
66	0	0	0.00	2	0	0.02	4	0	0.04
67	0	0	0.0	1	0	0.01	1	0	0.01
68	0	0	0.0	1	0	0.01	3	0	0.03
69	0	0	0.00	2	0	0.02	4	0	0.04
70	0	0	0.00	2	0	0.02	3	0	0.03
71	0	0	0.00	1	0	0.01	1	0	0.01
72	2	0	0.02	7	0	0.07	7	0	0.08
73	5	0	0.05	24	0	0.28	26	0	0.30
74	0	0	0.0	2	0	0.02	2	0	0.02
75	4	0	0.04	23	0	0.26	24	0	0.27
76	0	0	0.0	0	0	0.00	2	0	0.02
77	0	0	0.00	5	0	0.05	7	0	0.07
78	0	0	0.0	5	0	0.05	6	0	0.06
79	1	0	0.01	7	0	0.08	8	0	0.09
80	0	0	0.00	4	0	0.04	5	0	0.05
81	0	0	0.0	4	0	0.04	5	0	0.05
82	0	0	0.0	4	0	0.04	5	0	0.05
83	10	0	0.11	24	0.	0.28	25	0	0.28
84	0	0	0.0	1	0	0.01	1	0	0.01
85	0	0	0.0	3	0	0.03	3	0	0.03
86	0	0	0.0	1	0	0.01	1	0	0.01
87	0	0	0.0	0	0	0.00	0	0	0.00
88	0	0	0.0	0	0	0.00	0	0	0.00
89	0	0	0.0	0	0	0.0	0	0	0.0
90	3	0	0.03	8	0	0.08	8	0	0.08
91	0	0	0.0	0	0	0.0	0	0	0.0
92	1	0	0.01	1	0	0.01	1	0	0.01
93	1	0	0.01	1	0	0.01	2	0	0.02
94	1	0	0.01	3	0	0.03	3	0	0.04
95	21	0	0.24	25	0	0.29	26	0	0.30
96	0	0	0.00	1	0	0.01	2	0	0.02
97	0	0	0.00	1	0	0.01	1	0	0.01
98	0	0	0.00	0	0	0.00	2	0	0.02
99	5	0	0.05	14	0	0.15	15	0	0.17
80	4	0	0.04	10	0	0.10	11	0	0.12
81	1	0	0.01	9	0	0.09	11	0	0.12
82	2	0	0.02	4	0	0.04	6	0	0.06
83	1	0	0.01	6	0	0.07	8	0	0.08
84	1	0	0.01	4	0	0.04	6	0	0.06
85	0	0	0.00	3	0	0.03	5	0	0.05
86	0	0	0.0	1	0	0.01	5	0	0.05
87	0	0	0.0	1	0	0.01	1	0	0.01
88	0	0	0.0	0	0	0.00	1	0	0.01
89	0	0	0.0	0	0	0.0	1	0	0.01
90	0	0	0.0	0	0	0.0	0	0	0.00
91	0	0	0.0	0	0	0.0	2	0	0.02
92	0	0	0.0	0	0	0.0	1	0	0.01
93	0	0	0.0	0	0	0.0	1	0	0.01
94	0	0	0.0	0	0	0.0	1	0	0.01
95	0	0	0.0	0	0	0.0	0	0	0.0
96	0	0	0.0	0	0	0.0	0	0	0.0

Table 26 -- Final probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of Alternative VI (Shelikof Strait only).

	1 DAY			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
	59	0	0.9	75	1	1.4	80	1	1.6
SEABIRD FORAGING AREA SOUTH APRIL-SEPTEMBER	44	0	0.6	46	0	0.6	46	0	0.6
SEABIRD FORAGING AREA SOUTH OCTOBER-MARCH	48	0	0.7	49	0	0.7	49	0	0.7
SEABIRD FORAGING AREA NORTH APRIL-SEPTEMBER	1	0	0.0	2	0	0.0	4	0	0.0
SEABIRD FORAGING AREA NORTH OCTOBER-MARCH	0	0	0.0	2	0	0.0	3	0	0.0
SEA OTTER CONCENTRATION AREA A	0	0	0.0	0	0	0.0	1	0	0.0
SEA OTTER CONCENTRATION AREA B	0	0	0.0	1	0	0.0	3	0	0.0
SEA OTTER CONCENTRATION AREA C	0	0	0.0	1	0	0.0	2	0	0.0
SEA OTTER CONCENTRATION AREA D	29	0	0.3	35	0	0.4	36	0	0.4
SEA OTTER CONCENTRATION AREA E	6	0	0.1	11	0	0.1	11	0	0.1
SEA OTTER CONCENTRATION AREA F	0	0	0.0	0	0	0.0	3	0	0.0
SEA OTTER CONCENTRATION AREA G	0	0	0.0	0	0	0.0	0	0	0.0
SEA OTTER CONCENTRATION AREA H	1	0	0.0	2	0	0.0	3	0	0.0
RED RIVER SALMON SCHOOLING AREA	0	0	0.0	0	0	0.0	0	0	0.0
KARLUK RIVER SALMON SCHOOLING AREA	3	0	0.0	5	0	0.0	5	0	0.1
ROCKY, ALLIGATOR, AND GRASSY ISLANDS AREA	4	0	0.0	5	0	0.1	6	0	0.1
DARK, SENTINEL ISLANDS, AND LATAX ROCKS AREA	1	0	0.0	1	0	0.0	2	0	0.0
BARREN ISLANDS AREA	0	0	0.0	1	0	0.0	3	0	0.0
AUGUSTINE ISLAND AREA	0	0	0.0	0	0	0.0	0	0	0.0
KIUKPALIK, SHAKUN ISLANDS, AND SHAKUN ROCK AREA	10	0	0.1	14	0	0.2	15	0	0.2

Table 27 -- Final probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting targets over the production life of Alternative VI and the existing leases (CI).

	3 DAYS			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
LAND	90	2	2.3	99	4	5.0	100	5	5.8
SEABIRD FORAGING AREA SOUTH APRIL-SEPTEMBER	49	0	0.7	59	0	0.9	60	0	0.9
SEABIRD FORAGING AREA SOUTH OCTOBER-MARCH	63	0	1.0	76	1	1.4	76	1	1.4
SEABIRD FORAGING AREA NORTH APRIL-SEPTEMBER	75	1	1.4	78	1	1.5	78	1	1.5
SEABIRD FORAGING AREA NORTH OCTOBER-MARCH	75	1	1.4	77	1	1.5	77	1	1.5
SEA OTTER CONCENTRATION AREA A	9	0	0.1	15	0	0.2	20	0	0.2
SEA OTTER CONCENTRATION AREA B	4	0	0.0	20	0	0.2	30	0	0.4
SEA OTTER CONCENTRATION AREA C	18	0	0.2	32	0	0.4	36	0	0.4
SEA OTTER CONCENTRATION AREA D	37	0	0.5	59	0	0.9	61	0	0.9
SEA OTTER CONCENTRATION AREA E	10	0	0.1	23	0	0.3	24	0	0.3
SEA OTTER CONCENTRATION AREA F	0	0	0.0	0	0	0.0	4	0	0.0
SEA OTTER CONCENTRATION AREA G	29	0	0.3	31	0	0.4	32	0	0.4
SEA OTTER CONCENTRATION AREA H	49	0	0.7	67	1	1.1	68	1	1.1
RED RIVER SALMON SCHOOLING AREA	0	0	0.0	0	0	0.0	0	0	0.0
KARLUK RIVER SALMON SCHOOLING AREA	3	0	0.0	6	0	0.1	7	0	0.1
ROCKY, ALLIGATOR, AND GRASSY ISLANDS AREA	6	0	0.1	13	0	0.1	14	0	0.1
DARK, SENTINEL ISLANDS, AND LATAX ROCKS AREA	2	0	0.0	10	0	0.1	11	0	0.1
BARREN ISLANDS AREA	24	0	0.3	38	0	0.5	42	0	0.5
AUGUSTINE ISLAND AREA	33	0	0.4	44	0	0.6	45	0	0.6
KIUKPALIK, SHAKUN ISLANDS, AND SHAKUN ROCK AREA	12	0	0.1	22	0	0.2	23	0	0.3

Table 28 -- Final Probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of Alternative VI, existing leases and tanker transportation (including upper Cook Inlet).

LAND	3 DAYS			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
SEABIRD FORAGING AREA SOUTH APRIL-SEPTEMBER	95	2	3.0	100	7	7.8	100	9	9.3
SEABIRD FORAGING AREA SOUTH OCTOBER-MARCH	49	0	0.7	63	0	1.0	64	1	1.0
SEABIRD FORAGING AREA NORTH APRIL-SEPTEMBER	64	1	1.0	84	1	1.8	84	1	1.9
SEABIRD FORAGING AREA NORTH OCTOBER-MARCH	89	2	2.2	92	2	2.5	92	2	2.5
SEA OTTER CONCENTRATION AREA A	90	2	2.3	93	2	2.6	93	2	2.7
SEA OTTER CONCENTRATION AREA B	20	0	0.2	35	0	0.4	42	0	0.5
SEA OTTER CONCENTRATION AREA C	10	0	0.1	36	0	0.5	50	0	0.7
SEA OTTER CONCENTRATION AREA D	24	0	0.3	44	0	0.6	50	0	0.7
SEA OTTER CONCENTRATION AREA E	38	0	0.5	67	1	1.1	70	1	1.2
SEA OTTER CONCENTRATION AREA F	11	0	0.1	27	0	0.3	30	0	0.4
SEA OTTER CONCENTRATION AREA G	0	0	0.0	0	0	0.0	5	0	0.1
SEA OTTER CONCENTRATION AREA H	53	0	0.8	58	0	0.9	60	0	0.9
RED RIVER SALMON SCHOOLING AREA	56	0	0.8	83	1	1.8	85	1	1.9
KARLUK RIVER SALMON SCHOOLING AREA	0	0	0.0	0	0	0.0	1	0	0.0
ROCKY, ALLIGATOR, AND GRASSY ISLANDS AREA	3	0	0.0	8	0	0.1	9	0	0.1
DARK, SENTINEL ISLANDS, AND LATAX ROCKS AREA	6	0	0.1	16	0	0.2	18	0	0.2
BARREN ISLANDS AREA	3	0	0.0	13	0	0.1	15	0	0.2
AUGUSTINE ISLAND AREA	32	0	0.4	52	0	0.7	58	0	0.9
KIUKPALIK, SHAKUN ISLANDS, AND SHAKUN ROCK AREA	43	0	0.6	65	1	1.0	66	1	1.1
	12	0	0.1	24	0	0.3	27	0	0.3

Table 29 -- Final probabilities (expressed in percent chance) of one or more spills the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of Alternative VI.

SEGMENT	3 DAYS			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
1	0	0	0.0	0	0	0.0	0	0	0.00
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.00	1	0	0.01
4	0	0	0.0	0	0	0.0	0	0	0.00
5	0	0	0.0	0	0	0.0	0	0	0.00
6	0	0	0.0	0	0	0.0	0	0	0.00
7	0	0	0.0	0	0	0.0	0	0	0.00
8	0	0	0.0	0	0	0.00	0	0	0.00
9	0	0	0.0	1	0	0.01	1	0	0.01
10	0	0	0.0	1	0	0.01	1	0	0.01
11	3	0	0.03	4	0	0.04	5	0	0.05
12	4	0	0.04	5	0	0.05	5	0	0.05
13	8	0	0.09	9	0	0.10	10	0	0.10
14	4	0	0.04	6	0	0.06	6	0	0.06
15	16	0	0.17	19	0	0.21	20	0	0.22
16	2	0	0.02	4	0	0.04	4	0	0.04
17	5	0	0.06	8	0	0.08	9	0	0.09
18	0	0	0.00	0	0	0.00	0	0	0.00
19	0	0	0.0	0	0	0.0	0	0	0.0
20	0	0	0.0	0	0	0.00	0	0	0.00
21	0	0	0.0	0	0	0.00	0	0	0.00

22	0	0	0.00	1	0	0.01	2	0	0.02
23	1	0	0.01	2	0	0.02	3	0	0.03
24	2	0	0.02	3	0	0.03	3	0	0.03
25	0	0	0.0	0	0	0.00	0	0	0.00
26	1	0	0.01	1	0	0.01	1	0	0.01
27	1	0	0.01	1	0	0.01	2	0	0.02
28	0	0	0.0	0	0	0.0	1	0	0.01
29	0	0	0.0	0	0	0.00	0	0	0.00
30	0	0	0.0	0	0	0.00	1	0	0.01
31	0	0	0.0	0	0	0.00	0	0	0.00
32	0	0	0.0	0	0	0.00	1	0	0.01
33	0	0	0.0	0	0	0.0	1	0	0.01
34	0	0	0.0	0	0	0.00	1	0	0.01
35	0	0	0.0	0	0	0.0	0	0	0.00
36	0	0	0.0	0	0	0.0	0	0	0.0
37	0	0	0.0	0	0	0.00	0	0	0.00
38	0	0	0.0	2	0	0.02	2	0	0.02
39	0	0	0.0	0	0	0.00	1	0	0.01
40	0	0	0.00	1	0	0.01	2	0	0.02
41	1	0	0.01	4	0	0.04	4	0	0.04
42	2	0	0.02	3	0	0.03	3	0	0.03
43	0	0	0.00	3	0	0.03	3	0	0.04
44	3	0	0.03	6	0	0.06	6	0	0.06
45	20	0	0.22	23	0	0.26	23	0	0.27
46	2	0	0.02	4	0	0.04	4	0	0.04
47	1	0	0.01	3	0	0.03	3	0	0.03
48	6	0	0.06	9	0	0.09	9	0	0.09
49	2	0	0.02	5	0	0.05	5	0	0.05
50	0	0	0.0	0	0	0.0	0	0	0.00
51	0	0	0.0	0	0	0.0	0	0	0.00
52	0	0	0.0	0	0	0.0	0	0	0.0
53	0	0	0.0	0	0	0.00	0	0	0.00
54	0	0	0.0	0	0	0.0	0	0	0.00
55	0	0	0.0	0	0	0.0	0	0	0.0
56	0	0	0.0	0	0	0.0	0	0	0.00
57	0	0	0.0	0	0	0.0	0	0	0.00
58	0	0	0.0	0	0	0.0	0	0	0.0
59	0	0	0.0	0	0	0.0	0	0	0.00
60	0	0	0.0	0	0	0.00	0	0	0.00
61	0	0	0.0	0	0	0.0	0	0	0.0
62	0	0	0.0	0	0	0.0	0	0	0.0
63	0	0	0.0	0	0	0.0	0	0	0.0
64	0	0	0.0	0	0	0.0	0	0	0.0
65	0	0	0.0	0	0	0.0	0	0	0.0
66	0	0	0.0	0	0	0.0	0	0	0.0
67	0	0	0.0	0	0	0.0	0	0	0.0
68	0	0	0.0	0	0	0.0	0	0	0.0
69	0	0	0.0	0	0	0.0	0	0	0.0
70	0	0	0.0	0	0	0.0	0	0	0.0
71	0	0	0.0	0	0	0.0	0	0	0.0
72	0	0	0.0	0	0	0.0	0	0	0.0
73	0	0	0.0	0	0	0.0	0	0	0.00
74	0	0	0.0	0	0	0.0	0	0	0.0
75	0	0	0.0	0	0	0.0	0	0	0.0
76	0	0	0.0	0	0	0.0	0	0	0.0
77	0	0	0.0	0	0	0.0	0	0	0.0
78	0	0	0.0	0	0	0.0	0	0	0.0
79	0	0	0.0	0	0	0.00	0	0	0.00
80	0	0	0.0	0	0	0.00	1	0	0.01
81	0	0	0.00	0	0	0.00	1	0	0.02
82	0	0	0.0	0	0	0.00	0	0	0.00
83	0	0	0.0	0	0	0.00	1	0	0.01
84	0	0	0.0	0	0	0.00	1	0	0.01
85	0	0	0.0	0	0	0.00	0	0	0.00
86	0	0	0.0	0	0	0.0	0	0	0.00
87	0	0	0.0	0	0	0.0	0	0	0.00
88	0	0	0.0	0	0	0.0	0	0	0.00
89	0	0	0.0	0	0	0.0	0	0	0.0
90	0	0	0.0	0	0	0.0	0	0	0.00
91	0	0	0.0	0	0	0.0	0	0	0.0
92	0	0	0.0	0	0	0.0	0	0	0.00
93	0	0	0.0	0	0	0.0	0	0	0.0
94	0	0	0.0	0	0	0.0	0	0	0.0
95	0	0	0.0	0	0	0.0	0	0	0.0
96	0	0	0.0	0	0	0.0	0	0	0.0

Table 30 -- Final probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of Alternative VI and the existing leases (C-1).

SEGMENT	3 DAYS			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
1	0	0	0.0	0	0	0.0	0	0	0.00
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.00	2	0	0.02
4	0	0	0.0	0	0	0.0	1	0	0.01
5	0	0	0.0	0	0	0.0	0	0	0.00
6	0	0	0.0	0	0	0.0	0	0	0.00
7	0	0	0.0	0	0	0.0	1	0	0.01
8	0	0	0.0	0	0	0.00	1	0	0.01
9	0	0	0.0	1	0	0.01	2	0	0.02
10	0	0	0.0	1	0	0.01	2	0	0.02
11	3	0	0.03	6	0	0.06	7	0	0.07
12	4	0	0.04	9	0	0.09	9	0	0.10
13	10	0	0.10	19	0	0.21	20	0	0.22
14	6	0	0.07	14	0	0.15	14	0	0.16
15	18	0	0.20	27	0	0.31	28	0	0.33
16	3	0	0.03	10	0	0.10	10	0	0.11
17	7	0	0.07	19	0	0.21	20	0	0.23
18	1	0	0.01	4	0	0.05	5	0	0.05
19	0	0	0.0	0	0	0.00	0	0	0.00
20	0	0	0.00	1	0	0.01	1	0	0.01
21	0	0	0.0	0	0	0.00	1	0	0.01
22	0	0	0.00	2	0	0.02	2	0	0.02
23	1	0	0.01	2	0	0.02	3	0	0.03
24	2	0	0.02	3	0	0.03	4	0	0.04
25	0	0	0.0	0	0	0.00	0	0	0.00
26	1	0	0.01	1	0	0.01	1	0	0.01
27	1	0	0.01	1	0	0.01	2	0	0.02
28	0	0	0.0	0	0	0.0	1	0	0.01
29	0	0	0.0	1	0	0.01	1	0	0.01
30	0	0	0.0	0	0	0.00	2	0	0.02
31	0	0	0.0	0	0	0.00	0	0	0.00
32	0	0	0.0	0	0	0.00	1	0	0.01
33	0	0	0.0	0	0	0.0	2	0	0.02
34	0	0	0.0	0	0	0.00	2	0	0.02
35	0	0	0.0	0	0	0.00	1	0	0.01
36	0	0	0.0	0	0	0.0	0	0	0.00
37	0	0	0.0	0	0	0.00	1	0	0.01
38	0	0	0.0	3	0	0.03	3	0	0.04
39	0	0	0.0	1	0	0.01	2	0	0.02
40	0	0	0.00	3	0	0.03	4	0	0.04
41	1	0	0.01	5	0	0.05	5	0	0.06
42	2	0	0.02	5	0	0.05	6	0	0.06
43	0	0	0.00	5	0	0.06	7	0	0.07
44	3	0	0.03	11	0	0.11	11	0	0.12
45	23	0	0.26	37	0	0.46	37	0	0.46
46	4	0	0.04	10	0	0.11	11	0	0.12
47	1	0	0.01	4	0	0.05	5	0	0.05
48	6	0	0.07	12	0	0.12	13	0	0.14
49	4	0	0.04	10	0	0.11	13	0	0.14
50	3	0	0.03	5	0	0.05	6	0	0.06
51	1	0	0.01	2	0	0.02	2	0	0.02
52	0	0	0.0	0	0	0.00	0	0	0.00
53	13	0	0.13	21	0	0.24	21	0	0.24
54	19	0	0.21	32	0	0.39	33	0	0.40
55	0	0	0.00	2	0	0.02	2	0	0.02
56	19	0	0.22	27	0	0.32	29	0	0.34
57	0	0	0.00	1	0	0.01	1	0	0.01
58	3	0	0.03	8	0	0.09	9	0	0.10
59	6	0	0.06	11	0	0.12	11	0	0.12
60	7	0	0.07	12	0	0.13	12	0	0.13
61	1	0	0.01	3	0	0.03	3	0	0.03
62	0	0	0.00	4	0	0.04	4	0	0.04
63	0	0	0.00	3	0	0.03	3	0	0.03
64	0	0	0.00	6	0	0.06	7	0	0.07
65	0	0	0.0	1	0	0.01	1	0	0.01
66	0	0	0.0	1	0	0.01	2	0	0.02
67	0	0	0.0	0	0	0.00	0	0	0.00

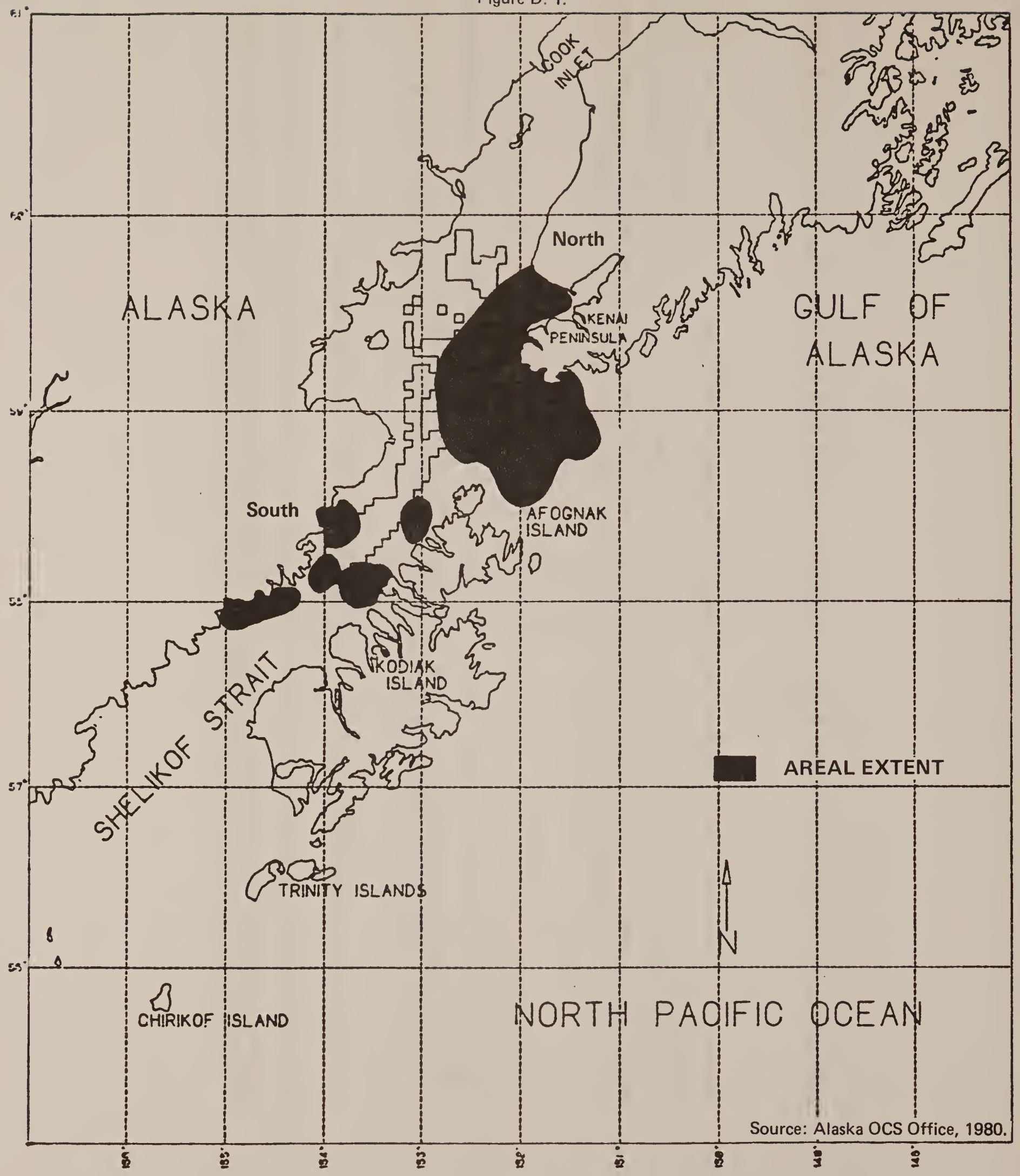
68	0	0	0.0	0	0	0.0	0	0	0.0
69	0	0	0.0	0	0	0.00	0	0	0.00
70	0	0	0.00	2	0	0.02	2	0	0.02
71	0	0	0.0	0	0	0.00	0	0	0.00
72	1	0	0.01	1	0	0.01	1	0	0.01
73	0	0	0.00	1	0	0.01	1	0	0.01
74	1	0	0.01	2	0	0.02	2	0	0.02
75	18	0	0.19	20	0	0.22	20	0	0.23
76	0	0	0.00	1	0	0.01	1	0	0.01
77	0	0	0.00	0	0	0.00	1	0	0.01
78	0	0	0.00	1	0	0.01	2	0	0.02
79	3	0	0.03	7	0	0.08	9	0	0.10
80	4	0	0.04	9	0	0.09	12	0	0.13
81	7	0	0.08	17	0	0.19	20	0	0.22
82	5	0	0.05	9	0	0.09	10	0	0.11
83	1	0	0.01	7	0	0.07	9	0	0.10
84	1	0	0.01	4	0	0.04	7	0	0.07
85	0	0	0.00	3	0	0.03	4	0	0.04
86	0	0	0.0	1	0	0.01	4	0	0.04
87	0	0	0.0	1	0	0.01	1	0	0.01
88	0	0	0.0	0	0	0.00	1	0	0.01
89	0	0	0.0	0	0	0.0	1	0	0.01
90	0	0	0.0	0	0	0.0	0	0	0.00
91	0	0	0.0	0	0	0.0	1	0	0.01
92	0	0	0.0	0	0	0.0	1	0	0.01
93	0	0	0.0	0	0	0.0	1	0	0.01
94	0	0	0.0	0	0	0.0	1	0	0.01
95	0	0	0.0	0	0	0.0	0	0	0.0
96	0	0	0.0	0	0	0.0	0	0	0.0

Table 31 -- Final probabilities (expressed in percent chance) of one or more spills, the most likely number of spills, and the expected number of spills occurring and contacting land segments over the production life of Alternative VI existing leases (C-1) and existing tanker transportation (including upper Cook Inlet).

SEGMENT	3 DAYS			10 DAYS			30 DAYS		
	PROB	MODE	MEAN	PROB	MODE	MEAN	PROB	MODE	MEAN
1	0	0	0.0	0	0	0.0	0	0	0.00
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.00	2	0	0.02
4	0	0	0.0	0	0	0.0	3	0	0.03
5	0	0	0.0	0	0	0.0	0	0	0.00
6	0	0	0.0	0	0	0.0	0	0	0.00
7	0	0	0.0	0	0	0.0	1	0	0.01
8	0	0	0.0	0	0	0.00	1	0	0.01
9	0	0	0.0	1	0	0.01	2	0	0.02
10	0	0	0.0	1	0	0.01	3	0	0.03
11	3	0	0.03	7	0	0.08	9	0	0.10
12	4	0	0.04	10	0	0.11	12	0	0.12
13	10	0	0.10	23	0	0.26	24	0	0.28
14	6	0	0.07	18	0	0.19	19	0	0.21
15	18	0	0.20	30	0	0.36	32	0	0.38
16	3	0	0.03	12	0	0.13	13	0	0.14
17	7	0	0.07	23	0	0.26	26	0	0.30
18	1	0	0.01	7	0	0.07	8	0	0.08
19	0	0	0.0	0	0	0.00	0	0	0.00
20	1	0	0.01	2	0	0.02	2	0	0.02
21	0	0	0.0	0	0	0.00	1	0	0.01
22	0	0	0.00	2	0	0.02	3	0	0.03
23	1	0	0.01	2	0	0.02	4	0	0.04
24	2	0	0.02	3	0	0.03	5	0	0.05
25	0	0	0.0	0	0	0.00	0	0	0.00
26	1	0	0.01	1	0	0.01	1	0	0.01
27	1	0	0.01	1	0	0.01	3	0	0.03
28	0	0	0.0	0	0	0.0	2	0	0.02
29	0	0	0.0	1	0	0.01	2	0	0.02
30	0	0	0.0	0	0	0.00	4	0	0.04
31	0	0	0.0	0	0	0.00	0	0	0.00

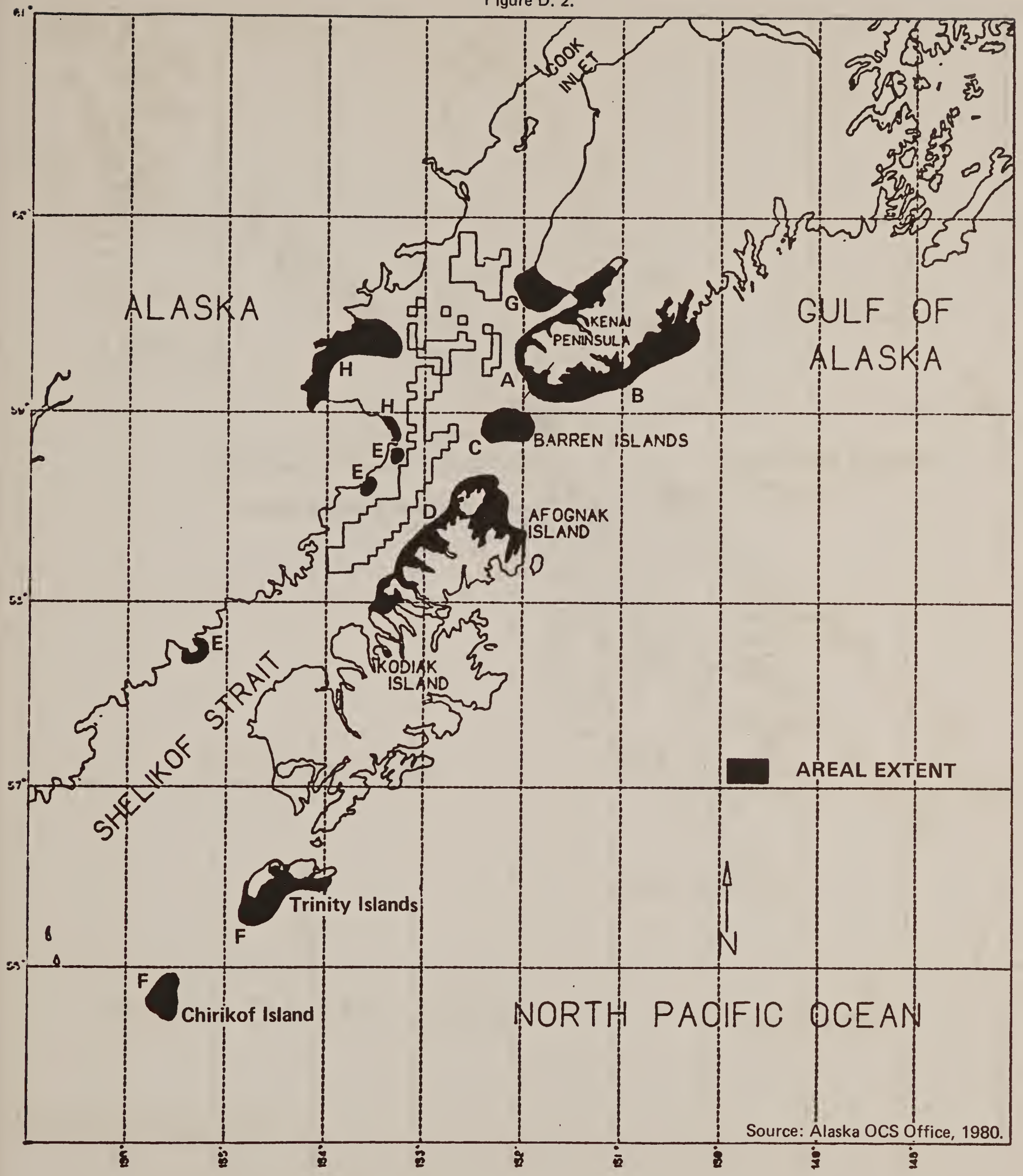
32	0	0	0.0	0	0	0.00	1	0	0.01
33	0	0	0.0	0	0	0.0	3	0	0.03
34	0	0	0.0	1	0	0.01	3	0	0.03
35	0	0	0.0	1	0	0.01	3	0	0.03
36	0	0	0.0	0	0	0.0	0	0	0.00
37	0	0	0.0	0	0	0.00	1	0	0.01
38	0	0	0.0	3	0	0.03	4	0	0.04
39	0	0	0.0	1	0	0.01	2	0	0.02
40	0	0	0.00	4	0	0.04	5	0	0.05
41	1	0	0.01	6	0	0.06	7	0	0.07
42	2	0	0.02	6	0	0.06	7	0	0.07
43	0	0	0.00	6	0	0.06	8	0	0.08
44	3	0	0.03	13	0	0.13	14	0	0.15
45	23	0	0.26	41	0	0.52	42	0	0.54
46	4	0	0.04	12	0	0.13	15	0	0.16
47	1	0	0.01	5	0	0.05	6	0	0.07
48	6	0	0.07	13	0	0.14	15	0	0.17
49	4	0	0.05	12	0	0.13	16	0	0.18
50	3	0	0.03	7	0	0.07	8	0	0.09
51	1	0	0.01	2	0	0.02	2	0	0.02
52	0	0	0.0	0	0	0.00	0	0	0.00
53	14	0	0.15	27	0	0.31	27	0	0.32
54	23	0	0.26	49	0	0.67	50	0	0.70
55	0	0	0.00	3	0	0.04	4	0	0.04
56	23	0	0.26	44	0	0.58	45	0	0.61
57	0	0	0.00	1	0	0.01	3	0	0.03
58	3	0	0.03	13	0	0.14	16	0	0.17
59	6	0	0.06	15	0	0.17	17	0	0.18
60	8	0	0.08	18	0	0.20	20	0	0.22
61	2	0	0.02	7	0	0.07	8	0	0.08
62	0	0	0.00	8	0	0.08	9	0	0.09
63	0	0	0.00	7	0	0.07	7	0	0.07
64	10	0	0.11	29	0	0.34	30	0	0.36
65	0	0	0.0	2	0	0.02	2	0	0.02
66	0	0	0.0	5	0	0.05	5	0	0.05
67	0	0	0.0	1	0	0.01	1	0	0.01
68	0	0	0.0	0	0	0.00	0	0	0.00
69	0	0	0.0	0	0	0.00	0	0	0.00
70	3	0	0.04	9	0	0.10	9	0	0.10
71	0	0	0.0	0	0	0.00	0	0	0.00
72	1	0	0.01	2	0	0.02	2	0	0.02
73	1	0	0.01	2	0	0.02	3	0	0.03
74	2	0	0.02	5	0	0.05	6	0	0.06
75	35	0	0.43	40	0	0.52	41	0	0.53
76	1	0	0.01	2	0	0.02	3	0	0.03
77	0	0	0.00	1	0	0.01	2	0	0.02
78	0	0	0.00	1	0	0.01	3	0	0.04
79	7	0	0.08	20	0	0.23	23	0	0.27
80	8	0	0.08	18	0	0.19	22	0	0.25
81	8	0	0.09	24	0	0.28	29	0	0.34
82	7	0	0.07	13	0	0.14	15	0	0.16
83	2	0	0.02	13	0	0.13	16	0	0.18
84	1	0	0.01	8	0	0.09	12	0	0.13
85	1	0	0.01	6	0	0.06	9	0	0.09
86	0	0	0.0	3	0	0.03	8	0	0.08
87	0	0	0.0	1	0	0.01	3	0	0.03
88	0	0	0.0	0	0	0.00	2	0	0.02
89	0	0	0.0	0	0	0.0	2	0	0.02
90	0	0	0.0	0	0	0.0	1	0	0.01
91	0	0	0.0	0	0	0.0	3	0	0.03
92	0	0	0.0	0	0	0.0	2	0	0.02
93	0	0	0.0	0	0	0.0	1	0	0.01
94	0	0	0.0	0	0	0.0	2	0	0.02
95	0	0	0.0	0	0	0.0	0	0	0.0
96	0	0	0.0	0	0	0.0	0	0	0.0

Figure D. 1.



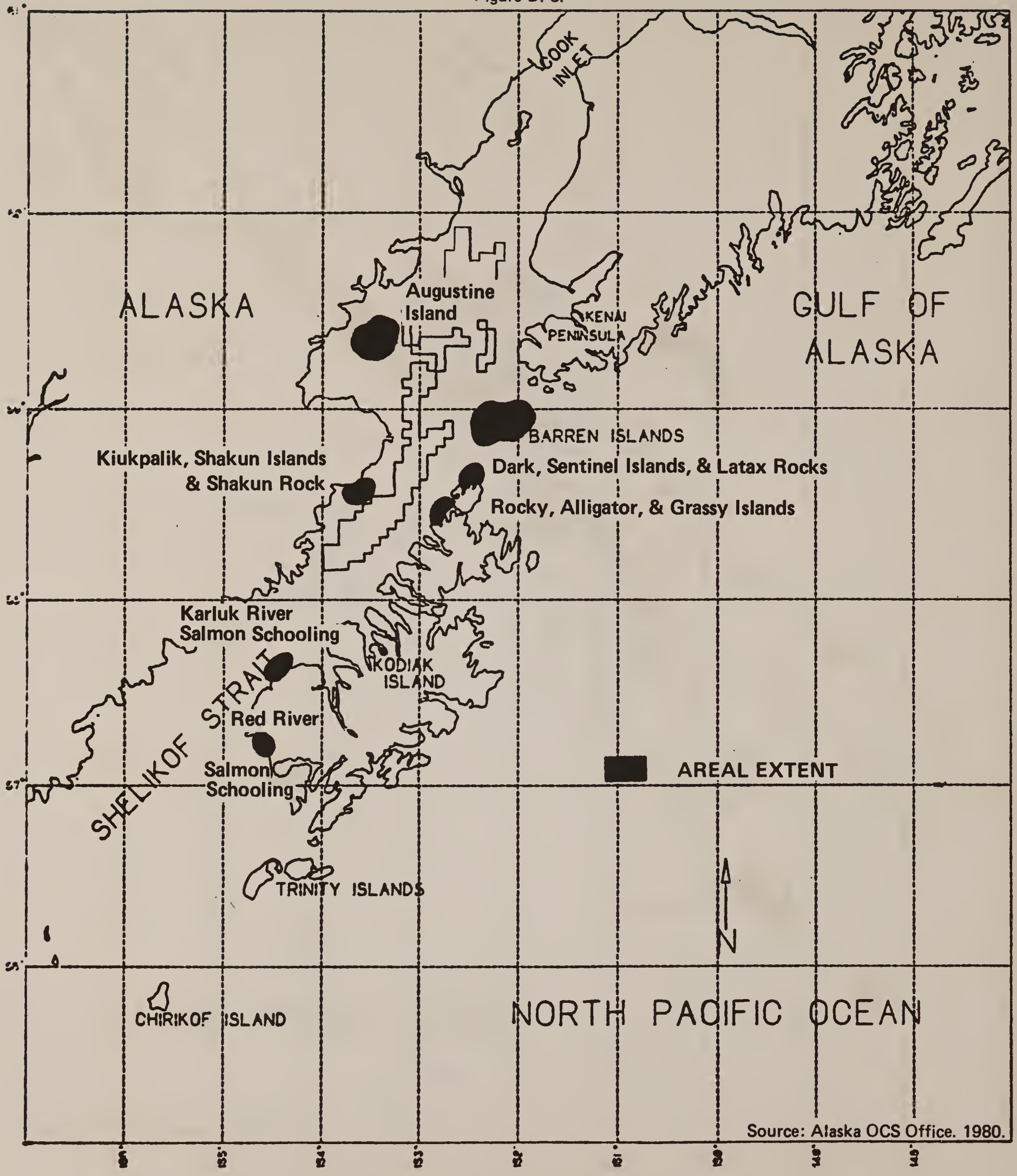
**LOCATION OF SEABIRD FORAGING AREAS, NORTH & SOUTH ,
OF COOK INLET OCS SALE 60**

Figure D. 2.



LOCATION OF SEA OTTER CONCENTRATION AREAS A THROUGH H, COOK INLET OCS SALE 60

Figure D. 3.



THE LOCATIONS OF 7 TARGETS, COOK INLET AND SHELIKOF STRAIT OCS LEASE SALE 60.

APPENDIX E

INVENTORY AND LOCATION OF POLLUTION CLEANUP EQUIPMENT AND MATERIALS, COOK INLET RESPONSE ORGANIZATION (CIRO) AND GULF OF ALASKA CLEANUP ORGANIZATION (GOACO)

CIRO OWNED/GOACO USE AGREEMENT EQUIPMENT INVENTORY
Revised 1/17/80

CLASS	TYPE/DESCRIPTION	QUANTITY	LOCATION
Oil Recovery	Acme Skimmer	1	Kenai Pipeline yard. Kenai, AK
Support Vans	Command & Control Vans - 40' - personnel and cummunication support	1 1	Kenai Pipeline yard. Kenai, AK City Dock Anchorage, AK
Oil Containment Booms	Vikoma Seapack 23' hull with 1450' of inflatable boom and related equipment does not include tow vessel.	1 1450'	Homer, AK
	Whittaker Expandi Boom 4300 - 43" skirt open water oil containment 200' sections	2000'	Kenai Pipeline yard. Kenai, AK
	Aqua Fence Open Water 30" Skirt	1000'	Kenai Pipeline yard. Kenai, AK
	Acme Harbor Boom - 12' Skirt - 200' Sections	1000'	Kenai Pipeline yard. Kenai, AK
		1000'	City Dock Anchorage, AK
Oil/Water Separators	200 Bbl Oil Separator Tanks	2 ea.	Kenai Pipeline yard. Kenai, AK
Oil Storage	100 Bbl Holding Tanks Marine Portable Skid Mounted	2	Kenai Pipeline yard. Kenai, AK
	Pillow Tank Firestone Fabri-tank, 25,000 US Gal.	1	Kenai Pipeline yard. Kenai, AK
	Inflatable Tank, Dunlap, towable, 2,500 U.S. Gal. Three 20' sections of tow hose.	1	Kenai Pipeline yard. Kenai, AK

CLASS	TYPE/DESCRIPTION	QUANTITY	LOCATION
Dispersants	Exxon Corexit 9527	102	Kenai Pipeline yard, ARCO Yard Kenai, AK
	" " "	90	
	" " "	90	Manley Terminal Homer, AK
	Exxon Collectant OC-5 (Herder)	1	Anchorage (CES)
Aerial Spray Units	Simplex/Aerial Spray Unit 200 Gal. capacity	2	Manley Warehouse Homer, AK Kenai Pipeline Kenai, AK
	Helo Spray Unit, 600 Gal. capacity	1	Kenai Pipeline yard. Kenai, AK
Bird Protection	Scare Away Model M-Y Propane filled.	20	Kenai Pipeline yard. Kenai, AK
		19	ARCO Warehouse Kenai, AK
		1	Anchorage (CES)
Oil Recovery Systems Skimmers	RECOVERER II - Lockheed 3100 self-propelled/Bay Harbor	1	City Dock Anchorage, AK
	Cyclonet 120 - M/V RIG ENGINEER modified for installation. High seas capability.	1	Rig Tenders Nikiski, AK
	RECOVERER - Cyclonet 070 Self-propelled. Open sea. Bay capability.	1	Onshore Homer, AK
	Cyclonet 050 Zodiac Boat 50 hp Mercury outboard, Bay/Harbor capability	1	Manley Terminal #3, Homer, AK
	Komara Mini Skimmers w/ Power pack	2	Manley Terminal #3, Homer, AK 1 KPH Property, Nikiski, AK

CLASS	TYPE/DESCRIPTION	QUANTITY	LOCATION
Work Boat	19' Zodiac 70 HP Volvo Penta O/B	1	Kenai, AK
Sorbents	Conwed Sorbent Blanket, Bale 150' x 30" x 3/8"	50 Bales	Kenai Pipeline yard. Kenai, AK
	Conwed Sorbent Pad 110 pads per bale 17" x 17"	23 Bales	ARCO yard Kenai, AK
	Conwed Sorbent Pillow 20 per Bale 18" x 12" x 4"	1 Bale	
	3M Sorbent Pads, Type 156 100 18x18x3/8 pads per Bale	18 Bales	
	3M Sorbent Sweeps Type 126 100' x 22" x 3/8" per Bale	10 Bales	
	3M Sorbent Boom Type 270 4 10' x 8" Boom per Bale	94 Bales	

The following equipment is also available in Kenai:

Quantity	Type	
1	Electric Generator, 3 KW, portable, gasoline powered with 2 flood lights, 100 w on tripod, 3 electrical leads, 75 ft.	GOACO
1	Electric Generator 7.5 KW, portable, gasoline powered. 110-220 volt.	CIRO
1	Air Compressor or 150 PSI 220, single phase	GOACO
20	Containment Boom Marker Lights.	GOACO
1	Vacuum cleaner, tank type, wet/dry.	GOACO
2	Barrel Pumps (hand op.).	GOACO
140'	3" Sunction hose (Camlock Fittings) 7 20' sections.	GOACO
140'	4" Sunction hose (Camlock Fittings) 7 20' sections.	GOACO
300'	3" Discharge hose (Camlock Fittings) 6 50' sections.	GOACO
300'	4" Discharge hose (Camlock Fittings) 6 50' sections.	GOACO
4	Diesel-powered, electric start Gorman Rupp trash pumps with fire/wash down nozzle attachment.	GOACO

GULF OF ALASKA CLEANUP ORGANIZATION

Inventory and Location of Equipment/Material

April 15, 1980

Function	Description	Quantity	Location
Command and Control	40' Vans, equipped to conduct management of the cleanup operation. (See Enclosure 1 complete list of items/equipment contained in each Van.)	2	Van #4 Anchorage Van #5 Kenai
Communications	Mobile Radio Repeaters (100 Watt) Receive on 459 MHZ/ Transmit on 454 MHZ.	2	Van #4 Anchorage Van #5 Kenai
	Base Station UHF Antenna, mounted on the 40' Command Center Vans, for use with Repeaters or Handheld MX-330 Radios.	2	Van #4 Anchorage Van #5 Kenai
	Marine Band; VHF transceivers (25 watt) Motorola Nautilus 440 with antennas.	2	Van #4 Anchorage Van #5 Kenai
	Aviation Band; 720 channels, 7 watts, King KY-92 transceivers (118 MHZ-136 MHZ)	2	Van #4 Anchorage Van #5 Kenai
	UHF/FM Handheld Radio, Motorola MX-330. Transmits on 459 MHZ or 454 MHZ. Receives only on 454 HMZ. Battery operated.	12	Anchorage
	Battery Chargers, Multiple and Single.	6	Anchorage
	Spare Batteries for MX-330 Radios.	12	Anchorage
	Citizen Band Radio w/antenna.	2	Van #4 Anchorage Van #5 Kenai
	Telephone System, 10 stations per command Center Van, PBX, intercom between all stations.		Van #4 Anchorage Van #5 Kenai

Function	Description	Quantity	Location
Storage/Fast Response	40' Vans, used to store material/equipment and to transport to spill site.	3	Van #1 Yakutat Van #2 Yakutat Van #3 Kenai
Containment of Oil	Wittaker Expandi Boom Model 4300 Seaboom (1000'/pallet, wt. 4,000#)	3000'	1000' Yakutat 2000' Kenai
	Acme Corral Boom (8" freeboard, 12" skirt, 200' section) (1000'/Trailer, 1000' Boom wt. 1,500#)	3000'	
	Marker lights for containment booms	20	Van #5 Kenai
Oil Pick Up	Cyclonet 150 Open Ocean Skimmer At 3-6 kts oil recovery rates range to 1,600 gallons/min. will operate in 10 ft. seas. Total system wt. apx. 75 tons	1	Stored in Long Beach, California
	Komara Miniskimmer, rotating disc type, maximum recovery rate of crude is 10 tons/hour (13 gal/min) Skimmer wt. 120# Hydraulic power pack wt. 330# Electric start.	2	Yakutat Kenai
	Acme Skimmer, 39TG-4 Wier is variable, and will pump 25 to 275 gal/min at a maximum head of 30 feet. Weight is 138 lb.	2	Yakutat Kenai
	Sorbent Boom, 3M Type 270 5, 8' x 8" booms/bale	40	Van #2 Yakutat
	Sorbent Blanket, 3M Type 100 One 150' x 30 " x 3/8" per roll	41	Van #2 Yakutat
	Sorbent Pad, 3M Type 156 100 18" x 18" x 3/8" per bale	14	Van #2 Yakutat
	Sorbent Pillow, 3M Type 240 10 5" x 14" pillows per bale	5	Van #2 Yakutat

Function	Description	Quantity	Location
Oil Pick Up (continued)	Sorbent Boom, 3M Type 270 5 8' x 8" booms/bale	74	Van #3 Kenai
	Sorbent Boom, 3M Type 270 5 8'x 8" booms/bale	20	Van #4 Anchorage
	Sorbent Blanket, Conwed One 150' 30" x 3/8" per roll	50	Kenai
	Sorbent Pad, Conwed 17½" x 17½" x ¼" (110/bale)	23	Kenai
	Sorbent Pillow, Conwed 18" x 12" x 4" (20/bale)	1	Kenai
	Sorbent Sweep, 3M Type (one 100'-22" x 3/8"/bale)	10	Kenai
	Sorbent Pads, 3M Type (100-18" x 18" 3/8"/bale)	18	Kenai
Oil/Water Separation	200 bbl Oil/Water Separator Tanks mounted on 40' flatbed, rated at 90,000# gross wt. Designed for use with Cyclonet 150 system. Can be used separately or for storage. Marine Portable on skids.	2	Van #8, Van #9 Kenai
Product Storage	100 bbl holding and separator tanks. Marine Portable on skids, stored on 60,000 lb. gross wt. 40' flatbed.	2	Van #6, Van #7 Kenai
	Pillow Tank, Firestone Frabritank 25,000 gal. Stored on flatbed (empty wt. 2,600 lb)	2	Van #1 Yakutat Van #7 Kenai
	Inflatable, Dracone Dunlop Towable Tank. 2,500 gal. (empty wt. 700 lb) Stored on flatbed.	2	Van #1 Yakutat Van #6 Kenai
Aerial Spraying	Helicopter Dispersant Applicator. Self powered, independent controls in cockpit. Empty wt. 705#, with payload (612 gal) - 5,600#	2	Van #1 Yakutat Van #3 Kenai

Function	Description	Quantity	Location
Dispersants	Exxon Corexit 9527 (36 drums in Van #3 Kenai)	102 Drums 80 Drums	Kenai Yakutat
Collectants	Exxon OC-5	5 Drums 1 Drum	Yakutat Kenai
Bird/Sea Mammal Protection	Scare away Model M-Y, propane fired, with individual propane tanks.	20	5 Anchorage 5 Kenai 10 ARCO Yard, Kenai
Workboats	Zodiak 19' Mark V inflatable workboat (equipped with outboard motors and safety equipment).	2	1 Yakutat 1 Kenai
Transportation/Storage	40' Modified Vans, equipped as an Operations Center and for storage of oilspill response materials.	5	2 Yakutat 2 Kenai 1 Anchorage
	40' Flatbed Trailers, selectively loaded with tanks, booms, skimmers for fast response.	4	4 Kenai
	19' Boat Trailers	2	1 Yakutat 1 Kenai
	Acme Boom/Skimmer Trailers	3	1 Yakutat 1 Kenai 1 Anchorage
Pumps and Power Packs	Trash Pumps, Gorman Rupp, 4", Diesel powered, electric start. (Fire/wash down nozzle attachment.)	4	4 Kenai
	Barrel Pump (hand operated)	1	Kenai
	Diesel power, Hydraulic power pack for Cyclonet 150 operations.	1	Kenai

Function	Description	Quantity	Location
Lighting	Portable Flood Lights, two (2) 1000 watt lights on tripod/ electrical leads.	2	Van #1 Yakutat Van #5 Kenai
Generators	Gasoline Generator, portable 3000 watts.	2	Van #1 Yakutat Van #4 Anchorage
Hoses	3" Suction Hose (Kamlock fittings)(3 20' sections)	60'	Yakutat
	3" Discharge Hose (Kamlock fittings)(2 50' sections)	100'	Yakutat
	4" Suction Hose (Kamlock fittings)(3 20' sections)	60'	Yakutat
	4" Discharge Hose (Kamlock fittings)(2 50' sections)	100'	Yakutat
	3" Suction Hose (Kamlock fittings)(7 20' sections)	140'	Kenai
	4" Discharge Hose (Kamlock fittings)(6 50' sections)	300'	Kenai
	4" Suction Hose (Kamlock fittings)(7 20' sections)	140'	Kenai
	4" Discharge Hose (Kamlock fittings)(6 50' sections)	300'	Kenai
Heating	Herman Nelson, BT-400-10 Gasoline Heaters (400,000 BTU cap)	2	Anchorage
Support	Vacuum Cleaners, tank type, wet or dry type, for use with Expandi Boom	2	Van #1 Yakutat Van #5 Kenai
	Hand Sprayers, 4 gal., dispersant applicators	4	2 Yakutat 2 Kenai
	Air Compressor, 150 psi 220v single phase	1	Kenai

Function	Description	Quantity	Location
Training	Slide Projector	1	Anchorage
	Camera SX-70	1	Anchorage
	Camera Cannon AE-1	1	Anchorage
	Video Tape Player/Recorder (to view training tapes)	1	Anchorage
	NUS Training Tapes, Oilspill Cleanup Series	23	Anchorage

GULF OF ALASKA CLEANUP ORGANIZATION

Command and Control Vans
Operations Center

Two 40' Semi Trailers have been equipped for Command Center oilspill cleanup operations. Each Van has a self-contained power plant, lighting, and heating system. The communication package used in the Vans is packaged in a manner to allow removal and use in a remote command center location. Listed below is a typical inventory contained in GOACO Vans #4 and #5:

a) Foul weather clothing/footwear for 12 people.
b) Two MSA Air Masks (Model #401, pressure demand).
c) Two fire/flame protections suits.
d) One resuscitator (MSA Portolator).
e) Spare parts for small engines, pumps, and generators.
f) Medical Kits for each Van and individual kits for 12 persons.
g) Oxygen and Masks for emergency medical use.
h) Steam/Hot Water cleaning machine (Anchorage).
i) Fire Extinguishers.
j) Cleaning materials and perservatives for equipment.
k) Small refrigerator.
l) Aluminum ladder.
m) Warn electric winch.
n) Equipped with rear loading ramp.
o) Four built-in bunks per van/with blankets (8 total).
p) Nylon line.
q) Antenna for UHF frequency (454.-459. MHZ), Antenna for VHF Marine Band, and Antenna for Aviation Band, Citizen Band.
r) 40' Van spare tires and rims.
s) Twelve (12) tables, twenty-four (24) chairs.
t) 110V extension cords (100').
u) Wind Speed and Direction Indicator.
v) Charts and Display Boards.
w) Clock.

Communication System

10 Station per Van #4 & #5 Telephone PBX System with 20 Station Intercom.

Radio, UHF-FM, hand held, Motorola MX-330. Transmit on 454. or 459. MHZ. Receives ONLY 454. MHZ. Type H44, battery operated with:

4 - Battery Chargers, Single
2 - Battery Chargers, Multiple

Mobile UHF-FM radio repeaters (100 Watt). Receive on 459. MHZ, transmit on 454. MHZ.

Marine Band, VHF Transceivers.

Aviation Band VHF Transceivers.

Citizen Band Transceivers.

APPENDIX F

OFFSHORE OIL POLLUTION COMPENSATION FUND

[4910-14-M]

Title 33—Navigation and Navigable Waters

CHAPTER I—COAST GUARD, DEPARTMENT OF TRANSPORTATION

SUBCHAPTER M—MARINE OIL POLLUTION LIABILITY AND COMPENSATION

[CGD 77-055]

PART 135—OFFSHORE OIL POLLUTION COMPENSATION FUND

PART 136—OFFSHORE OIL POLLUTION COMPENSATION FUND CLAIMS PROCEDURES

Implementation of Title III, Outer Continental Shelf Lands Act Amendments of 1978

AGENCY: Coast Guard, DOT.

ACTION: Final rules.

SUMMARY: These final regulations are required to implement recently enacted legislation which establishes an Offshore Oil Pollution Compensation Fund to be available for certain removal costs and damages caused by oil pollution arising in connection with Outer Continental Shelf (OCS) activities. The regulations are intended to convey to those persons affected by them the policies, uniform procedures, and administrative practices regarding the overall management and general operation of the fund.

EFFECTIVE DATE: March 17, 1979.

FOR FURTHER INFORMATION CONTACT:

Frank A. Martin, Jr., Commandant (G-WDWP/61), 400 Seventh Street SW., Washington, D.C. 20590, (202) 426-2606.

SUPPLEMENTARY INFORMATION: These final rules are being promulgated under the authority of Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (Pub. L. 95-372) (the Act) of September 18, 1978 and Executive Order 12123 of February 26, 1979 (44 FR 11199). Interested persons were invited to participate in the development of these rules by a notice of proposed rulemaking which appeared in the FEDERAL REGISTER issue of December 4, 1978 (43 FR 56840-55). In addition, the Coast Guard undertook a direct mailing of the proposed rules to known interested parties, issued press releases, and consulted with other Federal departments and agencies in the development of the proposed rules. Further, public hearings were held on the proposals in New Orleans, La. and Washington, D.C. on 4 and 8 January 1979 respectively.

In response to the invitation to comment, the Coast Guard received information and correspondence from over 60 respondents that contained slightly over 500 discrete comment items on the proposed rules. All comments received have been thoroughly evaluated and those within the scope of this rulemaking action have resulted in many changes which appear in the final rule.

A substantial number of comments were adopted, either in whole or in part, to the extent possible, and many were rejected. Except for editorial changes and as specifically discussed below, the final rules and the reasons therefor are the same as those given in the notice of proposed rulemaking. A discussion of all the issues raised in the comments received is impracticable and therefore only the most significant issues are discussed below.

Due to the need to use Parts 130 and 131 of Title 33 of the Code of Federal Regulations for other Coast Guard rulemaking projects, the final Offshore Oil Pollution Liability and Compensation regulations will appear in 33 CFR Parts 135 and 136. The final rules based on the proposals for Part 130 will be in Part 135 and those proposed as Part 131 will be in Part 136, even though the comments discussed below are keyed to the various sections proposed for Parts 130 and 131.

DISCUSSION OF MAJOR ISSUES

GENERAL COMMENTS

One commenter suggested that the regulations require States to designate a contact point to receive copies of financial responsibility documents for all vessels and facilities operating in areas which might affect those States. Those documents would be used by the States to assist claimants in making determinations required by the regulations. The comment was rejected because to adopt such an approach would be duplicative and costly. Advertisement required by the regulations will provide claimants the name, address, and telephone number of the person or persons from whom claim information may be obtained.

One commenter asked that the proposed regulations be amended to apply to watercraft transporting diesel fuel and other oil products to offshore facilities. Such a request would expand the scope of the Act beyond the limits established by the definition of "vessel" and, therefore, cannot be accommodated by regulation.

Approximately 18 industry commenters have suggested that "royalty oil" be excluded from production in calculating the amount of fee to be paid by the "owner", arguing that the Federal government is a part owner of OCS oil when it is produced. These commenters claim the Federal government is the owner of "royalty oil" at the time it is produced by virtue of the fact that the oil was taken in kind. Under OCS lease agreements (a copy of which appears in the FEDERAL REGISTER issue of September 29, 1978, 43 FR 44893-96) and regulations appearing in 30 CFR 225a.2(h), 250.20, 250.60 and 250.65, reference to "royalty and royalty oil" is an amount due the government in money or kind based on production removed from the lease. The royalty on crude oil, including condensate, is the percentage of the value or amount of crude oil produced. Thus, the Federal government is not part "owner" of the oil at the time it is produced. Because a large number of commenters raised this concern regarding "royalty oil" we have revised the final rule that levys the barrel fee, § 135.103(a). That section now specifically reflects that the per barrel fee applies at the time OCS oil is produced. The footnote to § 135.103 reflects our interpretation that the Federal government is not the owner of the oil at the time of production.

Several commenters from industry argued that either an increase in the ceiling price of OCS oil or a waiver of the restriction on selling such oil above the ceiling price be granted. It was recommended that the magnitude of such an increase or waiver be equal to the per barrel fee. One justification offered for such an action was that owners of pipelines and terminals will benefit from the Fund but will not contribute to its support. By treating the per barrel fee as a recoverable cost, all parties will be treated equally.

While such a justification may be valid, it should be pointed out, as has been recognized by the industry, that the Department of Energy (DOE) is the governmental entity tasked with review of such an issue. DOE has already established procedures to be followed to petition for this type of relief. Interested persons should consult 10 CFR 205. The Coast Guard has notified DOE of the concern expressed by industry with regard to this issue, but we stress that the burden of formal petition for administrative relief rests with industry.

One commenter pointed out that in our preamble to the proposed rules the discussion of the facilities covered by the Act for liability purposes did not specify that those facilities had to be located on the OCS. The Act clearly states that only those facilities located on the OCS are subject to the statute. Therefore, only facilities located on the OCS need comply with these regulations.

Numerous commenters requested that the regulations be clarified as to whether or not they apply to natural

gas production facilities and pipelines. The questions raised included whether facilities producing or transporting only natural gas and its condensate need apply for a certificate of financial responsibility and if the $.03 per ·l fee must be paid on natural gas ondensate.

.eral commenters assumed that natural gas and its condensate were not covered by the Act and suggested that the regulations should specifically exclude natural gas and condensate.

Several commenters said that natural gas and condensate do not constitute a threat to the environment if spilled and would not require any cleanup action. Because of this they suggested that the regulations should not apply.

One commenter suggested that if natural gas and condensate are subject to the regulations the minimal impact of a spill should be considered in determining the amount of financial responsibility that will be requested from these facilities.

After carefully examining all comments on this issue several changes to the regulations were made to make them more clear with respect to natural gas and condensate. These changes are reflected in the final rule at § 135.5 (b)(6), § 135.201(b)(7), and § 136.5 (b)(7). The Coast Guard is of the opinion that natural gas condensate, a liquid at atmospheric pressure and ambient temperature, is included in the definition of oil given in section 301 (13) of the Act. Natural gas itself is oil. The extent to which a facility ·ling natural gas will be subject to Act will depend on a factual analysis of the operation of the facility.

The acts of drilling for, producing, or processing natural gas will not, by themselves, require the owner or operator to establish evidence of financial responsibility. However, if the facility has the capacity to transport, store, transfer, or otherwise handle more than one thousand barrels of condensate at any one time, then evidence of financial responsibility is required.

Since the condensate is considered to be oil, it is subject to the per barrel fee on all oil production, and a discharge of the condensate creates liability and a duty to notify in the same manner as a discharge of oil.

One commenter suggested that mobile offshore drilling units not be considered "offshore facilities" while drilling, because they are used for exploration rather than production and for drilling rather than handling (producing) oil. The legislative history of the Act clearly indicates that once a drilling ship or other watercraft is attached to the seabed for exploration, development, or production, it is to be considered an offshore facility under Title III. Furthermore, by definition in the Act, "offshore facility" includes any drilling structure which is used to drill for oil produced from the OCS. Therefore, no changes in the proposed regulations were made in response to this comment.

The final regulations appearing in Part 136 apply only to claims against the Fund under the authority of section 307 of the Act. To extend the application of these regulations, or promulgate additional regulations, to cover claims against the owner, operator, or guarantor of the source of oil pollution, as suggested by several commenters, is beyond the authority of the Act. Furthermore, these regulations do not attempt interpretation or clarification of sections of the Act, such as section 304 (c), which are properly the province of the courts. Public access to information is not addressed in either the Act or these regulations; this subject is covered by existing law and regulations. Neither do the regulations provide for the representation of claimants as proposed by some commenters. The Act neither requires nor authorizes such government provided assistance although simple, and expedited, claims procedures are obviously contemplated.

Some concern was expressed by a number of commenters that the claims regulations, as proposed, did not provide sufficiently specific and detailed requirements and guidance. It remains our intent to promulgate the minimum regulations necessary to satisfy statutory requirements. To draft specific, detailed, regulations for every one of the myriad of potential situations which might occur is impossible. Such an approach, if possible, would likely allow little latitude for the exercise of judgment in the resolution of claims against the Fund, and probably would impose unnecessarily burdensome conditions on many claimants. The final rules regarding the compensation to be allowed reflect the minimum statutory requirements while allowing actual compensation to be made, on a case by case basis, based upon the conditions and circumstances of each individual claim.

A few commenters suggested changes or additions to the proposed claims rules that would impose, by regulation, restrictions on the actions of the Secretary, the Coast Guard, or the Fund Administrator, either beyond the scope of specific statutory requirements or simply not necessary for implementation of the Act. These, and comments addressed to internal administrative matters, were rejected as not proper subjects of rulemaking. The substance of many comments received from those who expressed concern regarding the supervision of the claims adjustor, while containing valid points, fall into this latter category and were not adopted in the final claims regulations.

SPECIFIC COMMENTS

PART 130

Several commenters asked for guidance as to what constitutes an "unlawful quantity" of oil or an "unlawful rate" of discharge under the definition of "oil pollution" in proposed § 130.5 (a) and as regards notification requirements in proposed § 130.305, and whether that quantity is consistent with the quantities which may be established as "harmful" under the Federal Water Pollution Control Act (FWPCA). Unlawful quantities and unlawful rates are those established by any applicable statute or regulation, including any that may be established under the FWPCA. Since they are established under other statutes or regulations, attempting to define them in these rules is not appropriate.

Several commenters felt that the definition of when a mobile offshore drilling unit (MODU) is considered an offshore facility, proposed § 130.201(b)(1), was not adequate. Although the exact wording suggested was not used, the final definition, § 135.201 (b)(3), incorporates the substance of the comment.

Another commenter suggested including the term "spudding in" in the definition of MODU, to describe the moment a MODU is first considered an offshore facility. This suggestion was not adopted. Some operations conducted by MODU's do not require "spudding in". The same commenter suggested different language defining termination of operations. The suggested change was not adopted but the final rule in § 135.201(b)(3) was changed to clarify this point.

One commenter suggested that when a MODU is conducting operations at an existing offshore facility, it should be considered part of that facility. We agree, provided the MODU and the platform are under one ownership, and have provided for this in § 135.201(b)(4).

Numerous comments were received suggesting various methods of defining an "offshore facility" for the purpose of showing financial responsibility in Subpart C.

Several commenters suggested that each OCS lease be considered one offshore facility and that the lease owner should be made to show financial responsibility for all operations on that lease.

Several commenters suggested that proposed § 130.201(b)(3) be changed to include as part of a platform or structure all transfer or gathering lines within a given field upstream of custody transfer, noting that this would eliminate certification of a large number of short lines within a field.

Other commenters suggested that all structures within a given field, whether or not connected, should be considered an offshore facility.

One commenter suggested that all structures which are physically connected in any manner and which are owned by one company or its subsidiaries be considered an offshore facility.

Several commenters suggested a "systems" approach to the definition of an offshore facility, utilizing either the point of custody transfer or the point where hydrocarbons are first separated, dehydrated, or otherwise processed as the end-point of the offshore facility.

Two commenters requested clarification of whether pipelines would constitute the type of physical connection required between structures to qualify them as a single offshore facility.

Several commenters suggested that segments of a pipeline system under one ownership be considered a single offshore facility.

The final rules in § 135.201(b) incorporate a systems approach to the definition of offshore facility which encompasses most comments. It allows an owner to group, within a field, all connected structures, including platforms and pipelines, into one facility up to the point of custody transfer. It also allows separate segments of a pipeline under one ownership to be considered as a single offshore facility.

A few commenters requested that we clarify under proposed Subpart C whether we intended the facility owner or the operator to apply for the Certificate of Financial Responsibility. The Act permits the owner or operator of the facility to show financial responsibility; we feel that either party may apply for a certificate. There is sufficient latitude for the parties to decide which one will apply. However, this does not affect the liability of either party under the Act. The final rule, § 135.204, clarifies who may apply for a certificate.

Several commenters asked that we further define the term "1000 barrels at any one time" in proposed § 130.203(a). One commenter suggested that we define it in terms of barrels per day, stating that this is the normal industry method of expressing such capacity. Our interpretation of section 305(b) of the Act where this term originated is that the Congress intended the term to mean the maximum volume of oil that could physically be contained in a pipeline at any specific moment in time. There is no indication in the legislative history that the volume of oil was to be related to barrels per day. Accordingly, this comment was not adopted.

Another commenter asked whether the term "1000 barrels of oil at any one time", in proposed § 130.203(a), included refined and lubricating oils, not produced on the OCS. As long as an offshore facility is involved, section 305(b) of the Act does not limit the type of oil. Therefore, refined and lubricating oils are included.

By far, the largest amount of public comment received was directed at proposed § 130.203. Paragraph (c) of that section subjects insurers to establish evidence of financial responsibility in the amount of $35,000,000 per facility. The comments indicated that, as the proposed section was written, there is not sufficient capacity in the insurance market to handle this type of a requirement and, if there were, the cost would be excessive. The increased cost or non-availability of insurance would have the greatest impact on small owners or operators who do not have the financial strength to self-insure.

We have reviewed and reassessed our proposed rules concerning coverage of multiple facilites in light of the above comments and the experience to date involving operations on the OCS. It is in the national interest to facilitate development of the energy resources on the OCS and the overall purpose of the Act is to further this goal. While there is undeniably some degree of increased risk of incurring liability as a result of an oil pollution incident if an owner or operator in involved with multiple facilities, data is not available to quantify the probable exposure. In our opinion the probability of simultaneous incidents is low. Since the owner or operator is required to *maintain* satisfactory evidence of financial responsibility, as well as establish it initially, we have decided to eliminate the proposed scale of financial responsibility limits for owners or operators of multiple facilities. Under the final rule, $35,000,000 is the maximum amount for which evidence of financial responsibility must be established.

It was not our intent to unduly burden the owner or operator choosing insurance as the means to establish evidence of financial responsibility. The final rule in § 135.203, clarifies that, so long as the assets represented by the evidence of financial responsibility in whatever form, are available to satisfy the potential liability of an owner or operator for each facility intended to be covered by that evidence, the maximum amount required is $35,000,000.

One commenter suggested that a provision be added to proposed § 130.203(b) to require replenishment of funds expended by a self-insurer to cover liabilities. It was suggested that otherwise a self-insurer's funds might be exhausted in response to an incident, and that damages resulting from subsequent incidents by that spiller might not be fully compensated. Inclusion of such a provision is not considered necessary. The regulations require an owner or operator to establish and *maintain* evidence of financial responsibility in the amount for which a certificate is granted. This maintenance provision is sufficient to cover the instance just described. Further, the Fund Administrator will reexamine the financial capability of a certificate holder after each incident to ensure that the requisite amount of financial responsibility is maintained.

Numerous comments were received with regard to the problems that proposed § 130.203(e) imposed on joint venture operations. The intent of that paragraph was to reduce the number of individual applicants for a single certificate to just one. The major problem that the proposed rule created was to impose a system on the industry which provides for coverage of a facility as an entity rather than coverage for each proportionate owner of a facility as is current industry practice. Commenters also indicated that a policy of requiring one member to acquire the insurance would discriminate in favor of the large individual owner. We agree with the basic comments not to impose a new system when existing OCS insurance arrangements have worked reasonably well since 1953. The requirements covering submission of evidence of financial responsibility have been rewritten in a new § 135.204 which accommodates the existence of participating owners while preserving our intent to receive proof of financial responsibility from one source who will be responsible for application and changes affecting the application.

One commenter recommended the substance of proposed § 130.203(d) be placed in proposed § 130.215 on certification. The rationale for this recommendation was that the substance of that provision more properly belonged with the requirements governing certification rather than amount. We agree and have therefore deleted the requirement from proposed § 130.203(d) and added it as a new paragraph (g) in the final rule in § 135.215.

One commenter requested that in proposed § 130.207(a) we specifically show which insurers will be acceptable to the Fund Administrator. The final rule, § 135.207(a), now indicates the general types of insurance underwriters whose insurance for financial responsibility may be acceptable to the Fund Administrator.

One comment concerning termination of an insurance policy indicated problems with the way proposed § 130.207(c) would require an additional 30 days risk on a normal 12 month policy. The comment also indicated the final rule should be more clear regarding the difference between the

normal termination date of a policy and cancellation by the insurer before the termination date.

When a policy is self-terminating, i.e., at the end of 12 months, the certificate will be issued for the same [illegible] and thus be self-terminating [illegible]. The final rule in § 135.207(c) provides that less than 30 days notification will be allowed where alternate evidence of financial responsibility has been arranged or in those cases where a facility ceases the operations which caused it to be classified as a offshore facility under Subpart C. The final rule in paragraph (c) of §§ 135.209-.211 has also been worded similarly to § 135.207(c), to avoid the same problems regarding termination of the other methods of financial responsibility.

In light of the great distances involved and variety of insurance underwriters, two commenters requested that we accept confirmation of coverage from approved insurance brokers in lieu of individual signatures by the underwriters as indicated on the proposed application form. This confirmation would contain details of the insurance coverage arranged. Paragraph (e) has been added to the final rule in § 135.207 to allow this method of confirmation.

Several commenters indicated severe problems with the requirement in proposed §§ 130.207-.211 that insurers, guarantors, and sureties agree to be sued directly. Commenters stated that [illegible]rance policies are contracts of in[illegible]uity and do not lend themselves to [illegible]t action suits. The Act is very specific in this area. Section 305(c) states that any claim authorized by section 303(a) may be asserted directly against the guarantor providing evidence of financial responsibility for the owner and operator. Therefore, the requirement remains in the final rules. Other commenters asked that we include the defenses to a direct action. Since the defenses are provided by statute, there is no need to address them in the regulations.

A substantial number of commenters advised that retention of the requirement in proposed § 130.207(e) and § 130.209(g) concerning joint and several liability would virtually eliminate insurance and guaranty as methods of showing financial responsibility, particularly among the smaller owners and operators. The Act imposes joint and several liability on the owner and operators and provides that claims may be directly asserted against their guarantors. We did not intend to add any requirements beyond those contained in the Act. Therefore, the "joint and several" requirement has been deleted in the final rules, §§ 135.207 and 135.209.

A few comments indicated that a guarantee, as proposed in § 130.209, is not a viable method for showing financial responsibility because it would restrict the amount of the guarantor's financial assets. The commenters apparently have interpreted our guarantee to be a guarantee of indebtedness. The method of guarantee we have indicated may be defined as a "guaranty" where one party promises to make good on the failure of another who is liable. Until a pollution incident actually occurs, as in the case of a catastrophic spill, no asset of the guarantor has been impaired nor has any liability been incurred; in fact, the guarantor may even transfer this risk to an insurance company. Accordingly, we have changed all references to "guarantee" in § 135.209 to "guaranty".

Two commenters recommended that the guarantor under proposed § 130.209 be allowed other methods to show financial responsibility such as self-insurance or insurance. There is no reason why a guarantor may not use the same methods as an owner or operator; so long as this coverage protects the owner or operator. We agree with the commenters and their rationale with respect to this issue and have therefore revised the final rule on guaranty as evidence, § 135.209, to provide the same type of supporting documentation and insurance allowed under §§ 135.207, 135.211 and 135.213.

Several comments were made as to why we required, in proposed § 130.209 (b) and § 130.213(a)(2), a Certified Public Accountant to certify a statement of working capital. With consolidated balance sheets we are unable to determine if the amount of working capital of a subsidiary, which is requesting the admission of evidence of self-insurance, is sufficient to cover the amount required. If insufficient for a subsidiary, the parent corporation may guarantee or indemnify the subsidiary through their consolidated proof. We agree that statements of working capital and assets need not be signed by a CPA when non-consolidated balance sheets support these additional statements, or when the statements represent the full backing of the consolidated entity. The Treasurer of the company or equivalent official will suffice in certifying these statements when a CPA is not necessary. We have revised the Final rule, § 135.213, by adding a new paragraph (b) to clarify this point. The requirement was deleted in its entirety from proposed § 130.209 due to the other changes made to that section.

A number of commenters have advised us that traditional contractual relationships between the offshore drilling contractors and oil company operators involve the oil company operators providing an indemnity to the drilling contractors for liability against oil pollution. In order to recognize this contractual relationship we have added a new § 135.210, to permit indemnity as a method of showing financial responsibility. This addition, however, in order to protect those that could be damaged, requires indemnitors to submit proof they are financially responsible. Indemnitors may provide the proof by any method recognized in § 135.205.

A few commenters stated that surety bonding proposed in § 130.211 is not a realistic method for establishing financial responsibility due to the cost. Although surety may be a costly method, we have not deleted this section in order to keep the surety option open for those companies who wish to buy the protection offered by a bonding company.

One commenter stated that in proposed § 130.213 (a) the words "Evidence of self-insurance * * * must be supported by * * *" suggest that some evidence other than that listed in the section may be required. Although we may need additional information in a specific case, § 135.215 (e) provides for that contingency. Under most expected normal circumstances the evidence explicitly required by the section for self-insurance will form a sufficient basis for determining whether to issue a certificate. We did not intend to imply otherwise.

Two commenters requested that we define "sufficient liquid assets" and "cash flow" as used in proposed § 130.213(a)(2), explaining that in the context used the intent of that paragraph was not clear. We have deleted reference to the term "sufficient liquid assets" in the final rules and rewritten the provision using more easily understood language.

One commenter suggested that proposed § 130.213(a)(1) be expanded to include foreign assets. The primary difficulty with including foreign assets is in the inability of the U.S. to gain control, if necessary, over the assets. Therefore, the suggested inclusion of foreign assets was not adopted.

With regard to this same section, other commenters advised that if we excluded foreign assets in the computation of working capital, we should also exclude foreign liabilities. In the final rule, § 135.213(a)(1), we have included clarifying language to indicate the paragraph was intended to apply to current U.S. assets and current U.S. liabilities only.

Several commenters advised that the requirement in proposed § 130.213(c) for filing of financial statements and 10-K reports at different time periods would create problems. They further advised that if a common 120 days after the financial period were adopted the 10-K report filed without the

other financial statements required by paragraph (a) of the section would be sufficient since the 10-K report contains most of that same financial data. We agree in part, and have therefore revised the paragraph, now paragraph (c) of § 135.213, to reflect that data submitted in the 10-K report need not be duplicated. This revision will result in reduced duplication and paperwork for those self-insurers who file 10-K reports with the Securities and Exchange Commission.

One commenter suggested that the phrase "The owner or operator or owner and operator of an offshore facility shall—" in proposed § 130.215(a) be changed to "Applicants shall—" and that the phrase "owner or operator of the offshore facility or an authorized representative" be eliminated from proposed paragraph (c) of that section because of definitional problems these phrases connoted. The commenter believed that such language could result in the erroneous interpretation that *each* owner or operator of a facility must shown financial responsibility to the full $35,000,000 amount. We agreed that this interpretation could occur and therefor adopted the commenter's suggestions in the final rule § 135.215 (a) and (c). We did not intend that a showing of financial responsibility for a facility having more than one owner exceed $35,000,000.

A number of commenters pointed out that the date in proposed § 130.215 (1) and (2), March 17, 1979, for submission of an application for a Certificate of Financial Responsibility was unrealistic. We acknowledged this might be the case; the notice of proposed rulemaking specifically requested recommendations for a time period sufficient to comply. The answers ranged from 30 days to 13 months. The principal reasons for the longer time period requested were to: (1) allow insurance policies, normally written for a 12 month period, to lapse and be renewed under the provisions of these regulations; (2) allow sufficient time for the completion of the insurance study required by section 305(d) of the Act; and (3) allow sufficient time for the Fund Administrator to establish operating procedures and forms for filing. We concur that the period for submission of applications needs extending and feel that six months is sufficient to accomplish the certification tasks. The Act requires as quick a response as possible. We have, therefore, revised § 130.215 (a)(1) and (2) (now § 135.215 (a)(1) and (2)) to reflect September 17, 1979 as the date by which applications must be filed with the Fund Administrator. We anticipate that the forms should be available from the Fund Administrator or any Coast Guard District Office by June 1, 1979.

The 45 days lead time required in proposed § 130.215 (a)(2) before placing a facility in operation was considered excessive by many commenters. They felt the lead time may not allow for the contingency that a replacement mobile offshore facility may be required at short notice and a shorter lead time should therefore be allowed. The originally proposed 45 day lead time is considered necessary for reviewing original proofs of financial responsibility. Where a previously approved owner or operator is only adding additional facilities to be covered by evidence of financial responsibility previously submitted, regardless whether those additional facilities are mobile or fixed, the applicant will not be subject to the 45 day requirement. We have clarified our intent with respect to this issue by adding a new paragraph (a)(3) in § 135.215.

Several commenters expressed concern that duplicate submissions of evidence of financial responsibility would result from the way the proposed regulations in Subpart C were written. The commenters contended that this would result in a ponderous and costly certification process. Several other commenters requested we consider blanket certification of facilities and consolidated applications, to simplify the certification process, particularly where an owner owns more than one facility. The regulations have been revised and clarified to simplify the certification process.

The need to known each facility in existence on the OCS and who is financially responsibile is evident. Adoption of a blanket certification process would not provide this needed information. However, once an owner or operator has established evidence of financial responsibility, this evidence need not be duplicated to cover the addition of other facilities if the established amount of financial responsibility is sufficient to cover additional facilities and applies to them. Notification through an application, of the additional facilities to be covered by the previously established evidence of financial responsibility is all that is required.

In addition, proposed § 130.217 regarding display of Certificates of Financial Responsibility has been deleted. Although the Act authorizes the proposed requirements, further examination of the problems involved and alternatives available has convinced us that they are not needed. Unlike vessels, facilities remain in place and they are not subject to the denial of entry and detention sanctions, which must be applied immediately to be effective. Verification of a facility's coverage by a Certificate of Financial Responsibility can be accomplished through data compiled at Fund headquarters. Accordingly, the holder of a certificate may retain it at whatever location desired.

The former paragraph (c) of proposed § 130.217 has been moved to a new paragraph (f) under § 135.215.

One commenter criticized the requirement in proposed § 130.217(c) for not containing any standards or criteria regarding under what circumstances the holder or owner of a certificate would be required to surrender the certificate on demand. We have revised that paragraph (which now appears in § 135.215(f)) to include a reference to the standards enumerated in § 135.223.

Several commenters recommended changing the time period in proposed § 130.219 (a) to allow sufficient time to notify the Fund Administrator of changes which significantly affect the owner's or operator's financial position. There was also one comment as to what we mean by the term "significantly affect". We have changed the time period to 10 days, in § 135.219 (a), to allow sufficient time for a written notification. The reason for not extending the time to a 30 day period, as requested by several of the commenters, is that circumstances for which notification must be given are those which might affect the ability of the owner or operator to meet their liability under the Act, thereby exposing the Fund. This exposure should be as limited as possible, while giving the owners and operators a reasonable time in which to act. We believe that 10 days is appropriate. The term "significantly affect" is not used in the final rule since it is ambiguous.

Several commenters questioned the adequacy of the procedures in proposed § 130.223 (d) for review of actions to revoke Certificates of Financial Responsibility. Several asked for more time to respond to a notice of intent to revoke. Others asked that provisions for hearings and judicial review be added to the final rule and that the time periods in paragraph (c) and (d) of proposed § 130.223 be clarified. We basically agree with the commenters and have therefore revised § 135.223 to provide for a hearing process and to clarify the expression of time periods therein. That section also now addresses denials of certificates. Judicial review after final agency action is governed by section 309 of the Act.

Several comments were received in response to our request in the preamble to the proposed rules (page 56844) for specific comments on the draft application form. One commenter requested we clarify the type of choice of facility; delete "refinery", add "offshore production platform" (including

drilling operations); change "drilling structure" to "mobile drilling unit;" and clarify the meaning of first and second affidavits. The choice of facilities as proposed is agreeable. The purpose of the first and second affidavits allow for more than one type of nce or more than one insurer, guaranty etc. to be presented. We did not intend to limit the number to only two because third, fourth, etc. attachments could be made.

Another commenter requested a line be provided for printing or typing the name under the signature and also room for the person's title. This space will be provided in the final form.

Several commenters requested we use forms similar to those of the Federal Maritime Commission. We have found through the hearings and comments that there is very little similarity in vessel and facility operations with respect to financial responsibility. Therefore, we feel we must design our own forms.

Other changes will be made to the draft forms, based upon the changes reflected in the final rules regarding multiple ownership, methods of insuring the individual proportional owner, and variety of facilities. Final forms should be available by June 1, 1979.

Several commenters felt that the occurrences listed in proposed § 130.303(a)(3) were inappropriate, either because they were too all-encompassing or because they did not include all possible occurrences. The examples of occurrences, with the exception of the term "weakness", were not changed since each of the listed types likely to cause pollution or incur removal costs (as per section 304(a) of the Act) and, therefore, should be reported. The term "weakness" was deleted since this condition may not be readily apparent.

Several commenters stated that it was not clear that "occurrences which pose an imminent threat of oil pollution" were to be reported. These are specifically included in the definition of incident in section 301 of the Act. To clarify this, proposed § 130.305(a) (now § 135.305(a)) was revised to specifically include those occurrences.

Three comments dealt with notification procedures; two with dual notification problems under these regulations and 33 CFR Part 153, and one with a recommendation for a change in the order of priority. This section was written with 33 CFR 153.203 in mind and the requirements are essentially the same, the primary difference being the second notification option. In most cases in the Coastal Region, the predesignated On Scene Coordinator (as specified in the second option of 33 CFR 153.203) will be the same person listed in the second option of these regulations. Section 130.305 was proposed in this manner to insure that notification would eventually reach the Fund Administrator. Proposed § 130.305(a)(1) (now § 135.305(a)(1)) was revised to show that this option is only available within the continental United States. A new paragraph (b) was added to this section to clarify the fact that notice submitted in accordance with this section also satisfies the requirements of 33 CFR Part 153.

Three commenters suggested adding to proposed § 130.305 rules requiring the Coast Guard to inform and provide copies of notification documents to concerned coastal States. Notification of all incidents is already being provided to the States under the FWPCA response program in which the States are closely involved. Other commenters suggested that the States be provided copies of the notice of designation under proposed § 130.309. However, this designation is subject to denial by the source. If the designation is denied, claims may be presented to the Fund. In either event, complete information as to the claim procedures to be followed in presenting claims will be advertised. For these reasons the suggested additional provisions concerning notifications of incidents and notification of designation were not adopted.

One commenter was dissatisfied with the process and procedure for denial of designation proposed in § 130.311. The Notice of Designation does not affix blame or establish liability. Its sole purpose is to identify an apparent source and those responsible for that source to undertake claim settlement procedures. When an apparent source denies designation or cannot be identified, the Fund will advertise and respond to claims, and seek reimbursement when actual liability can be established. In response to this and other comments, a new paragraph (c) was added to the final rule, § 135.311, to clarify the fact that a source who fails to deny designation does not necessarily incur liability for the spill.

Numerous commenters stated that the five day time period in proposed § 130.311(a) for denial of designation was too short. This provision comes from section 306(b)(2) of the Act and is not subject to alteration by implementing regulations.

Two commenters recommended alternative language for proposed § 130.313(a) which would more clearly indicate that advertisement may not be necessary for each incident. This recommendation was adopted, with minor editorializing, and now appears in § 135.313(a).

One commenter recommended that the designated source be allowed to negotiate advertising requirements and appeal the Commandant's decision. This was considered inappropriate since prompt advertising is mandated by the Act; however, a new paragraph (b)(5) was added to § 135.313, to allow consideration of any information or recommendations submitted by the designated source.

One commenter suggested that proposed § 130.313 be revised to provide an upper limit of time and cost of required advertising. Section 306(d) of the Act establishes minimum time limits. Upper limits of either time or cost are not considered appropriate since advertising requirements must be determined by the circumstances of each incident. This comment was rejected.

One commenter suggested that proposed § 130.315 be revised to require a news release for each incident which is to be advertised. Another commenter suggested that size and format for newspaper ads should be specified. Neither of these suggestions was adopted. News releases may not be required for each individual incident, and thus should not be mandatory. To specify size and format of ads in the regulations is considered to be overly restrictive. This, as well as the particular section of a newspaper where the ad will appear, is one of the items which go into considering the "most effective means" as specified in § 135.313(b)(4).

One commenter suggested that the content of advertisement under proposed § 130.319(a) should require each advertisement to contain a warning to potential claimants concerning possible non-payment for claims resulting from negligent or intentional acts. This suggestion was not adopted because the purpose of advertisement is not to suggest whether claims are payable. Rather, the sole purpose of advertising is to advise potential claimants of claim procedures.

One commenter suggested that the term "provide access" appearing in paragraph (a) of proposed § 130.401 be changed to "permit access" since the cost of such access should not have to be incurred by the owner, operator, master or agent. We agreed and have made this change to the final rule in § 135.401(a).

Further, since we have deleted proposed § 130.217 in its entirety, for reasons discussed elsewhere in this preamble, and the requirements therein for the display of Certificates of Financial Responsibility at manned and unmanned offshore facilities, we have also deleted all reference to facility in § 135.401(a). That section now applies to access to vessels only.

Specific Comments

PART 131

A number of revisions based upon comments received have been made to the claims rules proposed in Part 131.

In order to accommodate these revisions in the final rules, three additional terms, as defined in the Act, have been added to the definitions proposed in § 131.5(a). These new terms now appear in the final rule at § 136.5(a).

Several commenters suggested that the definition of "natural resources" in proposed § 131.5(b)(6) be expanded to include additional specific, items; other commenters believed the definition was too broad and "open-ended". After review of these comments we concluded the definition is expansive enough to include all possible natural resources contemplated by the Congress (e.g. beaches, marshland, etc.) and yet restricted to those categories of natural resources contemplated. Accordingly, the suggested changes were rejected and the definition of "natural resources" in the final rule, § 136.5(b)(6), remains as proposed.

The time limitations in proposed § 131.101(a) reflect specific statutory provisions and were not changed. However, "may" has been changed to "will" to accurately denote Fund implementation of the statutory limitation. Proposed § 131.101(b) has been modified to remove an apparent inconsistency with proposed § 131.105(b). Proposed § 131.105(c) remains unchanged; the suggestion received that a claim be considered presented to the Fund on the date received by any other person is inconsistent with section 307(1) of the Act and was rejected.

For administrative convenience, and to obviate the need for two separate, essentially identical, groups of regulations on the same subject, § 136.103 requires federally authorized removal costs to be referred to the Federal Water Pollution Control Act (FWPCA) revolving fund. The Fund Administrator will subsequently reimburse the revolving fund. (The duties of On Scene Coordinators (OSC), with respect to oil pollution covered by the Act, remain unchanged; neither the Act nor these regulations change the existing authority and responsibility of the OSC under FWPCA, as amended, regarding oil pollution.)

The time proposed in § 131.109(b) for referral of unsettled claims has been increased to seven days in the final rule, § 136.109(b), to provide for five working days in most cases. This change is in response to several comments that indicated that five days was insufficient time. Since section 308 of the Act requires proof of the amount offered in settlement, the exclusion of material related to settlement offers has been dropped from the final rule.

Proposed § 131.115 has been substantially revised and expanded in order to include elements of proof omitted in the proposed regulations (as pointed out in many comments) and to insure that all statutory requirements for claims are addressed by regulation. This section (now § 136.115) applies to all claims, and is in addition to particular items of proof required by Subpart C of Part 136 for specific types of claims. Several terms are used for which reference must be made to definitions of the Act. Section 136.115(a)(5) establishes a requirement that actions taken to avoid the loss be shown; this is in recognition of the limitations upon recovery of section 304(f)(2) of the Act. Paragraph (b) of section 304 of the Act reflects statutory requirements regarding cleanup costs.

Proposed § 131.127 (now § 136.125) regarding costs incident to claim preparation, which applies to all claims (including those for injury or destruction of natural resources) has been slightly revised to clarify that recovery will not be allowed for such costs, even if reasonable, if not necessary for the preparation of the claim. This is not to imply that recovery of such costs is to be limited or denied on the basis of amount alone, but that the claimant show that the expenditure was necessary as well as the amount reasonable. These changes are in response to commenters who requested clarification of this point.

Proposed § 131.207(a) has been revised in order to more clearly reflect all potential claimants in this category contemplated by the Act.

A new subparagraph (1) has been added to § 131.209(a) (other proposed subparagraphs are retained and renumbered) to include, specifically, the requirement for proof that property or natural resources have been injured or destroyed. The requirement (now in § 136.209(a)(3)) that the reduction of income be only a "consequence" of the injury or destruction is consistent with the Act; a stricter standard is not indicated by either the statutory language or the legislative history.

Proposed § 131.211(a) has been revised slightly in order to include all potential earnings or income which could be lost, as well as to distinguish between *loss* of employment and *reduction* in employment (loss or reduction of wages, only). Proposed § 131.211(c) has been deleted, as suggested by a comment, as superfluous.

No specific reference to the natural restorative process has been included in the final version of proposed § 131.215 because this is considered an integral part of determining actual injury and the calculation of economic loss suffered.

Proposed § 131.217 has been revised to eliminate reference to the undefined concept of "unit value" (which was strongly criticized in several comments) and to add recognition of other economic loss which may occur.

No change has been made to proposed § 131.219; as written it is considered sufficiently broad to include all potential claimants, including subsistence users of natural resources.

The requirement that alternative sources of income be considered in determining compensation to be awarded as a result of loss of use of natural resources has been specifically added to proposed § 131.223, as suggested in some comments. This section is now consistent with other compensation sections, incorporating this reasonable condition upon any recovery while preserving the remedial intent of the Act.

The requirements in § 136.225 reflect the provisions of the Act and impose no special qualifications on claimants for cleanup costs. Such claimants are subject to the proof requirements of Subpart B and § 136.227 before any compensation can be awarded.

The requirement that compensable cleanup costs incurred be "reasonable" is imposed in § 136.229 (unchanged from the proposed rule) not to limit the types of costs recoverable (these are sufficiently and broadly defined in the Act) but to require that only the reasonable costs of such measures be compensable.

The intent of proposed § 131.305 is to provide general guidelines which permit the administrative law judge, or panel, to conduct proceedings, subject to the Administrative Procedure Act and these regulations, in the manner best suited to resolution of specific cases being considered. The word "proceedings" in proposed § 131.305(c) has been changed to "hearing" to make specific the intention not to require a record of a preliminary conference. In addition, proposed § 131.305(c) has been expanded to include assignment of the costs of transcripts of administrative proceedings, as requested by one commenter.

Regulatory Analysis

This rulemaking has been reviewed under the final Department of Transportation Regulatory Policies and Procedures for Improving Government Regulations, 44 FR 11034-45, effective March 1, 1979. When initially proposed, we treated this rulemaking as "significant" and prepared a draft Regulatory Analysis under interim Departmental guidelines. After further review, and concurrence by the Secretary of Transportation, we have reclassified this rulemaking as "non-significant". However, a final Regulatory Analysis has nevertheless been prepared and may be obtained by interested persons by submitting a written request to the Fund address listed in

the final rule at § 135.9(a) or calling (202) 426-2606.

Numerous comments were received which took issue with the statement appearing at pps. 3-4 of the draft Regulatory Analysis that "* * * the Coast Guard has concluded that the proposed regulations are basically procedural in nature and * * * are not likely to have a major general economic impact * * *." The concern expressed in virtually all comments received was that it would be extremely difficult and costly, if not impossible, for much of the offshore industry to show the evidence of financial responsibility required by the proposed regulations. As a result, it was argued that the possible adverse consequences recognized by the Coast Guard would be realized. Those consequences included a reduction in competition, a reduction in production, and ultimately, an increase in the cost of OCS petroleum to the consumer.

Part of the concern expressed over this issue may have resulted from a failure to realize what is meant by a "major economic impact". According to the Department of Transportation guidelines, a regulation will have a major economic impact if it will result in an annual effect on the economy of $100 million or more, will result in a major effect on the general economy in terms of costs, consumer prices, or production, or will result in a major increase in costs or prices for individual industries, levels of government, or geographic regions. Assuming that insurance will be available at a reasonable cost and that the cost estimates made by the Coast Guard are accurate, it may be concluded that the impact of the regulations does not begin to approach the magnitude described as "major" by the DOT guidelines.

Several specific reasons were advanced as to why it would not be possible to meet the financial responsibility requirements originally proposed. The surety method was described as "totally useless." The cost of a surety bond under the FWPCA was quoted as 2% per year. Though it may not be proper to expect exactly the same cost under Title III, that cost does provide some indication of the expected cost to obtain a surety bond under Title III. In a case where joint owners provide evidence in proportion to their interests, such a cost may not be considered burdensome. However, in a case where an individual owner desires to provide evidence by the surety method, such cost might be prohibitive. In addition to the yearly cost, a bonded company must pay back any amount paid out by the bonding company. It should be pointed out that the regulations do not mandate that this method be used; rather, it is one option which may be selected.

The guarantee method was considered somewhat limited because it was felt that large companies would provide a guarantee only to their subsidiaries. That may or may not be be true. Large companies may guaranty firms other than their subsidiaries in order to obtain necessary services that may be more economically performed by outside firms than by their subsidiaries. The guaranty method may not turn out to be the most often selected method of establishing evidence, but it does offer a viable alternative.

It was also stated that if a guarantee was to be provided it would have to be treated as a contingent liability on the guarantor's balance sheet, thereby limiting the guarantor's ability to obtain funds through issuance of debt. According to the Financial Accounting Standards Board's "Statement of Financial Accounting Standards No. 5," a guarantee need not be disclosed as a contingent liability if it involves "* * * an unasserted claim or assessment when there has been no manifestation by a potential claimant of an awareness of a possible claim or assessment unless it is considered probable that a claim will be asserted and there is a reasonable possibility that the outcome will be unfavorable." Even in the case where a guaranty was to be considered a contingent liability, the amount to be recognized would only be that amount considered reasonably expected to be called upon in the event of a spill. An estimate of expected removal costs and damage claims payments suggests that the amount to be recognized would be quite small. Therefore, a guaranty would not necessarily limit a guarantor's ability to issue debt and may be considered a viable method of establishing evidence of financial responsibility.

Several owners and operators of MODU's expressed concern that indemnity was not available as a method of establishing evidence of financial responsibility. It may be stated that indemnity was available in the proposed regulations due to the provision that the Fund Administrator could accept alternative evidence at his discretion. However, since indemnity has historically been available to owners and operators, it has been specifically included in the final regulations as an acceptable method. Acceptance of an indemnity reduces the economic impact to owners and operators of MODU's because it enables presently established procedures to be followed. Since indemnitors can be expected to have established a relatively high amount of evidence for their own operations, in most cases the marginal increase caused by providing an indemnity to others will be relatively slight.

No comments were received concerning the cost of obtaining evidence by the guaranty or indemnity method. It may be assumed that there would be no net cost of a guaranty or indemnity provided by a parent to a wholely owned subsidiary. However, in a case where other than a wholely owned subsidiary has contracted with a guarantor or indemnitor to perform a service, there would probably be an appropriate modification in the fee charged for service. The guarantor or indemnitor might then be required to incur an additional expense in order to obtain the additional evidence necessary. Any expense incurred would depend upon the method chosen to establish evidence of financial responsibility. Ultimately, that expense may be expected to approximate the cost of insurance since guaranty and indemnity may be thought of as merely a form of insurance.

Comments received concerning the cost of insurance generally indicated that, due to the requirements imposed by the proposed regulations, insurance would probably not be available at any cost. It was felt, however, that if several changes were made to the proposed regulations a market would develop. Unfortunately, the comments received did not indicate what the cost of insurance would be if such changes were incorporated in the final regulations. Several suggested changes have been made to the proposed regulations and it is now felt than an insurance market will develop.

Ultimately, the cost of insurance will be determined by the magnitude of removal costs and damages paid by industry. The Coast Guard has estimated that on an average annual basis the amount paid will be approximately $10 million. That amount does not seem large enough to cause one to conclude that the cost of insurance will be substantial. However, because the deviation in that figure in any one year is quite high, it is possible that a rather large premium could be charged to insure such an exposure.

The Coast Guard has made every effort to ensure that the final regulations are structured so that it will be possible to establish evidence of financial responsibility. It must be assumed that the suggestions provided by industry, and to a large extent adopted by the Coast Guard, were sufficient to meet that goal. Therefore, the Coast Guard remains of the opinion that the regulations are basically procedural in nature and are not likely to have a major economic impact as defined by DOT regulatory guidelines. The Coast Guard will closely monitor the impact of the regulations in this area, with particular attention being given to the insurance study to be conducted by the Department of Commerce. Should

the cost of establishing evidence of financial responsibility be found to be unreasonable the regulations concerning financial responsibility may be modified.

RTHER EVALUATION OF FINAL RULES

Because these regulations constitute an entirely new program, the Coast Guard will closely monitor their implementation. Unless serious problems are encountered, the Coast Guard intends to wait until the program has been in full operation for approximately one year before proposing modifications. Comments on these rules may be submitted at any time, to the Fund address listed in § 135.9(a), however, actual experience under the program will provide the best basis for suggesting future adjustments to these rules.

EXCEPTION TO THIRTY DAY EFFECTIVE DATE RULE

Section 315(b) of the Act requires that the rules and regulations required to be promulgated under Title III shall be effective on the 180th day after enactment of this title. Enactment occurred on September 18, 1978; therefore, the effective date of these rules is March 17, 1979. We find the statutory mandate is good cause for making these regulations effective in less than the normal 30 days following publication of a final rule.

Although these final rules are effe-ve March 17, 1979, section 313(c) of Act requires enactment of an appriations act before the Fund will ..ave the authority to make contracts, to make disbursements, to issue notes or other obligations under section 302(f) of Title III, to charge and collect fees under section 302(d) of Title III, or to exercise any other spending authority. This legislation has not yet been enacted. Therefore, as a practical matter, the Offshore Oil Pollution Compensation Fund is not yet operative. The Coast Guard will issue a notice to announce when the Fund becomes operational.

Issuance: In consideration of the foregoing. Chapter I of Title 33 of the Code of Federal Regulations is amended by adding a new Subchapter M to read as follows:

SUBCHAPTER M—MARINE OIL POLLUTION LIABILITY AND COMPENSATION

PART 135—OFFSHORE OIL POLLUTION COMPENSATION FUND

Subpart A—General

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135.1 Purpose.
135.3 Applicability
135.5 Definitions.
135.7 Delegation—Fund Administrator.
[illegible] Fund address.

Subpart B—Levy of Fees

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135.103 Levy and payment of barrel fee on OCS oil.
135.105 Adjustment of levy.

Subpart C—Financial Responsibility for Offshore Facilities

135.201 Applicability.
135.203 Amount required.
135.204 Submission of evidence.
135.205 Methods of establishing.
135.207 Insurance as evidence.
135.209 Guaranty as evidence.
135.210 Indemnity as evidence.
135.211 Surety bond as evidence.
135.213 Qualification as self-insurer.
135.215 Certification.
135.219 Notification of changes affecting certification.
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135.223 Certificates, denial or revocation.

Subpart D—Notification, Designation, and Advertisement

135.301 Purpose.
135.303 Definitions.

NOTIFICATION

135.305 Notification procedures.
135.307 Notification contents.

DESIGNATION

135.309 Notice of designation.
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ADVERTISEMENT

135.313 Advertisement determinations.
135.315 Types of advertisement.
135.317 Frequency and geographical scope of advertisement.
135.319 Content of advertisement.

Subpart E—Access, Denial, and Detention

135.401 Access to vessel Certificates of Financial Responsibility.
135.403 Sanctions for failure to produce vessel Certificates of Financial Responsibility.
135.405 Appeal provisions.

AUTHORITY: Title III, Pub. L. 95-372, 92 Stat. 670 (43 U.S.C. 1811 et. seq.); EO 12123, 44 FR 11199; 49 CFR 1.46.

Subpart A—General

§ 135.1 Purpose.

(a) This part prescribes the policies, procedures, and administrative practices regarding offshore oil pollution liability and compensation, including the administration and general operation of the fund established under Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (Pub. L. 95-372, 43 U.S.C. 1811 et. seq.).

§ 135.3 Applicability.

(a) This part applies to each person who—

(1) Owns oil obtained from the Outer Continental Shelf when the oil is produced;

(2) Owns, operates, or is the guarantor of the owner or operator of any vessel;

(3) Owns, operates, or is the guarantor of the owner or operator of any offshore facility;

(4) Sustains an economic loss as a consequence of oil pollution arising from Outer Continental Shelf activities; or

(5) Otherwise has responsibilities under Title III of the Act and the regulations in this part.

§ 135.5 Definitions.

(a) As used in this part, the following terms shall have the same meaning as defined in section 301 of Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (Pub. L. 95-372): "barrel"; "claim"; "discharge"; "facility"; "Fund"; "guarantor"; "incident"; "offshore facility"; "oil pollution"; "operator"; "owner"; "person"; "person in charge"; "public vessel"; and "vessel".

(b) As used in this part—

(1) "Act" means Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (Pub. L. 95-372), entitled "Offshore Oil Spill Pollution Fund".

(2) "Captain of the Port" means a Coast Guard officer designated as Captain of the Port for the areas described in Part 3 of this chapter, or that person's authorized representative or, where there is no Captain of the Port area, the District Commander.

(3) "Commandant" means the Commandant of the Coast Guard or that person's authorized representative.

(4) "District Commander" means the Coast Guard officer commanding a Coast Guard District described in Part 3 of this chapter, or that person's authorized representative.

(5) "Fund Administrator" means the person to whom the authority and functions of the Commandant as administrator of the Fund are delegated.

(6) "Oil" means petroleum, including crude oil or any fraction or residue therefrom and natural gas condensate, except that the term does not include natural gas.

(7) "Outer Continental Shelf" or "OCS" means "Outer Continental Shelf" as defined in section 2(a) of the Outer Continental Shelf Lands Act (43 U.S.C.1331(a)).

§ 135.7 Delegation—Fund Administrator.

(a) The Fund Administrator is delegated authority to perform those functions assigned or delegated to the Secretary of Transportation under the Act not reserved by the Secretary of Transportation or the Commandant.

(b) The Fund Administrator may redelegate and authorize successive redelegations of the authority granted in

paragraph (a) of this section within the command under which that person has jurisdiction or to members of the Fund staff.

§ [illegible] Fund address.

The address to which correspondence relating to the Coast Guard's administration of the Fund is to be directed and the location of the Fund Administrator is Offshore Oil Pollution Compensation Fund, U.S. Coast Guard Headquarters (G-W/73), 400 Seventh Street, S.W., Washington, D.C. 20590.

Subpart B—Levy of Fees

§ 135.101 Purpose.

(a) The purpose of this subpart is to state the general requirements concerning the levy of fees.

§ 135.103 Levy and payment of barrel fee on OCS oil.

(a) A fee of $.03 per barrel is levied on all oil produced on the OCS and shall be imposed on the owner of the oil when such oil is produced.

(b) The owner of oil obtained from the OCS shall, for the purpose of computing the barrel fee levied in paragraph (a) of this section, measure OCS oil production by employing the methods and criteria of the U.S. Geological Survey contained in 30 CFR 250.60 and OCS Order 13.

NOTE.—Payment of the fee levied in paragraph (a) of this section is made in accordance with the fee collection regulations by the Secretary of the Treasury. Federal Government entitlement to [illegible]y oil does not constitute ownership of oil at the time of production.

§ 135.105 Adjustment of levy.

(a) The Commandant modifies or suspends by regulation the barrel fee levied in § 135.103(a) to maintain the statutory Fund level.

(b) The Commandant gives at least 90 days notice before any barrel fee modification or suspension becomes effective.

Subpart C—Financial Responsibility for Offshore Facilities

§ 135.201 Applicability.

(a) This subpart applies to the owner or operator of each offshore facility required by the Act to establish and maintain evidence of financial responsibility.

(b) For the purpose of this subpart:

(1) All structures, including platforms, wells, and pipelines, are considered a single offshore facility if they are physically connected, located upstream of the point of custody transfer, within the same oil field, and under one ownership.

(2) If separate parts of a structure, [illegible]ding platforms and pipelines, are owned separately, each part having common ownership is considered a separate offshore facility.

(3) A mobile offshore drilling unit is considered an offshore facility from the moment a drill shaft or other device connected to the unit first touches the seabed or connects to a well for the purposes of exploration, development, or production of oil until drilling is completed and the unit is no longer attached to the well or drill hole by any device.

(4) A mobile offshore drilling unit considered an offshore facility under paragraph (b)(3) of this section remains a separate facility when physically connected to another offshore facility, unless both are under one ownership.

(5) All segments of a common carrier pipeline from the point of custody transfer to the shore, including any pumping or booster stations, which are under one ownership are considered a single offshore facility.

(6) Any pipeline, which is under one ownership, between two offshore facilities, or between an offshore facility and the shore, is considered a single offshore facility.

(7) Offshore facilities which drill for, produce, or process only natural gas are not subject to this subpart unless the facilities have the capacity to transport, store, or otherwise handle more than 1,000 barrels of condensate at any one time.

NOTE.—Regulations governing financial responsiblity and certification for vessels are promulgated by the Federal Maritime Commission.

§ 135.203 Amount required.

(a) Each facility that is used for drilling for, producing, or processing oil, or which has the capacity to transport, store, transfer, or otherwise handle more than one thousand barrels of oil at any one time must be covered by evidence of financial responsibility submitted by or on behalf of the owner or operator of the facility, in the amount of $35,000,000.

(b) Evidence of financial responsibility established and maintained by a person who owns or operates more than one facility, or who has an interest in the ownership or operation of more than one facility, may be applied by that person towards establishing and maintaining the required evidence of financial responsibility for each facility in which that person has an interest, if the evidence is available to satisfy liabilities arising out of incidents involving those facilities.

§ 135.204 Submission of evidence.

(a) Where the offshore facility is owned and operated solely by one person, that person must establish and maintain evidence of financial responsibility covering the facility.

(b) Where the offshore facility is owned in its entirety by one person and operated solely by another person, evidence of financial responsibility covering the facility must be established and maintained by either the owner or the operator, or, in consolidated form, by both the owner and operator.

(c) Where the offshore facility is owned or operated by more than one person, evidence of financial responsibility covering the facility must be established and maintained by any one of the owners or operators, or, in consolidated form, by or on behalf of two or more owners or operators.

(d) When evidence of financial responsibility is established in a consolidated form, the proportional share of each participant must be shown. The evidence must be accompanied by a statement authorizing the applicant to act for and in behalf of each participant in submitting and maintaining the evidence of financial responsibility.

(e) Each owner and operator of a facility is subject to the penalty provided by section 312(a) of the Act if evidence of financial responsibility is not established and maintained for that facility.

§ 135.205 Methods of establishing.

(a) Evidence of financial responsibility may be established by any one, or any combination acceptable to the Fund Administrator, of the following methods:

(1) Insurance;

(2) Guaranty;

(3) Indemnity;

(4) Surety bond; or

(5) Qualification as self-insurer.

(b) The Fund Administrator will accept alternative evidence of financial responsibility if, in the Fund Administrator's opinion, it establishes an equivalent degree of financial responsibility for the purposes of this subpart.

§ 135.207 Insurance as evidence.

(a) Insurance filed with the Fund Administrator as evidence of financial responsibility shall be issued by an insurer that is acceptable to the Fund Administrator. Those insurers may include domestic and foreign insurance companies, corporations or associations of individual insurers, protection and indemnity associations, or other persons acceptable to the Fund Administrator.

(b) An insurer must—

(1) Agree to be sued directly, within the limits of the policy coverage, by any person for claims under the Act against the owner or operator; and

(2) Designate an agent in the United States for service of process.

(c) Insurance as evidence of financial responsibility must indicate the effec- date in the endorsement on the cation for Certificate of Financial ponsibility, and must remain in force until the date of termination indicated in the endorsement or until—

(1) 30 days after mailing, by certified mail, to the Fund Administrator, and the person insured, notification of intent to cancel; or

(2) Other evidence of financial responsibility acceptable to the Fund Administrator has been established; or

(3) The facility to which the insurance applies ceases to be a facility under § 135.201(b).

(d) Termination of insurance coverage shall not affect the liability of the insurer for an incident occurring before the effective date of termination.

(e) Confirmation of insurance may be accepted from an insurance broker that is acceptable to the Fund Administrator, subject to the Fund Administrator's approval of the individual underwriters, in lieu of their signature on an application, provided the confirmation:

(1) States the insurance covers liabilities under the Act;

(2) Sets forth the limit and deductible;

(3) Provided for direct action against the individual underwriters to the ent of their contracts;

) Names the underwriters and percages of the limit accepted by each;

(5) States that the underwriters agree to give prior written notice of cancellation or change to the Fund Administrator as required in paragraph (c) of this section; and

(6) States that the notice indicated in paragraph (e)(5) of this section will not affect the underwriter's liability for incidents occurring before the effective date of cancellation.

§ 135.209 Guaranty as evidence.

(a) Guarantors must—

(1) Agree to be sued directly, within the limits the guaranty, by any person for claims under the Act against the owner or operator; and

(2) Designate an agent in the United States for service of process.

(b) Guaranties filed as evidence of financial responsibility must be accompanied by the same proof that the Guarantor is financially responsible as this subpart would require of the owner or operator; i.e. insurance, surety bond, self-insurance, or other acceptable methods.

(c) A guaranty as evidence of financial responsibility must indicate the effective date in the endorsement on the ication for Certificate of Financial onsibility, and must remain in force until the date of termination indicated in the endorsement or until—

(1) 30 days after mailing, by certified mail, to the Fund Administrator, and the person guarantied, notification of intent to cancel; or

(2) Other evidence of financial responsibility acceptable to the Fund Administrator has been established; or

(3) The facility to which the guaranty applies ceases to be a facility under § 135.201(b).

(d) Termination of the guaranty shall not affect the liability of the guarantor for an incident occurring before the effective date of termination.

§ 135.210 Indemnity as evidence.

(a) An indemnitor must—

(1) Agree to be sued directly, within the limits of the contract coverage, by any person for claims under the Act against the owner or operator to the extent of the indemnity coverage; and

(2) Designate an agent in the United States for service of process.

(b) Indemnity filed as evidence of financial responsibility must be accompanied by the same proof of the indemnitor's financial responsibility as this subpart would require of the owner or operator; i.e. insurance, surety bond, self-insurance; or other acceptable methods.

(c) An indemnity as evidence of financial responsibility must indicate the effective date in the endorsement on the application for Certificate of Financial Responsibility, and must remain in force until the date of termination indicated in the endorsement or until—

(1) 30 days after mailing, by certified mail, to the Fund Administrator, and the person indemnified, notification of intent to cancel; or

(2) Other evidence of financial responsibility acceptable to the Fund Administrator has been established; or

(3) The facility to which the indemnity applies ceases to be a facility under § 135.201(b).

(d) Termination of an indemnity shall not affect the liability of the indemnitor for an incident occurring before the effective date of termination.

§ 135.211 Surety bond as evidence.

(a) Each surety bond filed with the Fund Administrator as evidence of financial responsibility shall be issued by a bonding company that—

(1) Is authorized to do business in the United States;

(2) Is licensed to do business in the state or territory in which the bond is executed;

(3) Is certified by the Department of the Treasury with respect to the issuance of Federal bonds in the penal sum of the bond; and

(4) Designates an agent in the United States for service of process.

(b) The bonding company must agree to be sued directly, within the limits of the surety bond, by any person for claims under the Act against the owner or operator.

(c) A surety bond as evidence of financial responsibility must indicate the effective date in the endorsement on the application for Certificate of Financial Responsibility, and must remain in force until the date of termination indicated in the endorsement or until—

(1) 30 days after mailing, by certified mail, to the Fund Administrator, and the person bonded, notification of intent to cancel; or

(2) Other evidence of financial responsibility acceptable to the Fund Administrator has been established; or

(3) The facility to which the surety bond applies ceases to be a facility under § 135.201(b).

(d) Termination of the surety bond shall not affect the liability of the surety for an incident occurring before the effective date of termination.

§ 135.213 Qualification as self-insurer.

(a) Qualification for self insurance must be supported by a copy of the self-insurer's current balance sheet, income statement, and statement of changes in financial position that are certified by an independent Certified Public Accountant and must be accompanied by either—

(1) An additional statement confirming that the self-insurer's current U.S. assets, including those of consolidated subsidiaries held in the U.S., not including pledged assets or stock not publicly traded, exceed the current U.S. liabilities, and the self-insurers net worth exceeds the amount of the requested self-insurance; or

(2) A statement, based on an analysis of the self-insurer's financial position, which shows that sufficient assets or cash flow, other than which might be damaged as a result of a pollution incident, are available which may be liquidated to provide the funds necessary to retire a claim for the amount of the self-insurance without placing the self-insurer in an insolvent position.

(b) The statements required by paragraphs (a) (1) and (2) of this section must be prepared and submitted by the involved Certified Public Accountant when the required financial statements are prepared in consolidated form and the liability represents less than the full financial backing of the consolidated entity, otherwise they may be prepared and submitted by the Treasurer or equivalent official.

(c) If the self-insurer files a Securities and Exchange Commission Form 10-K report, a copy of the self-insur-

er's most recent 10-K report must be filed with the Fund Administrator within 120 days after the end of the fiscal year to which it relates, in addition to filing the most recent 10-K with the initial application.

Each self-insurer must file annually with the Fund Administrator, copies of documents required under paragraph (a) of this section, within 120 days after the close of the self-insurer's fiscal accounting period. If a self-insurer files a 10-K report with the Fund Administrator under paragraph (c) of this section which contains some of the financial statements required in paragraph (a), a separate filing of those specific statements need not be made.

§ 135.215 Certification.

(a) Applicants shall—

(1) If the facility is in existence before September 17, 1979, apply for a Certificate of Financial Responsibility before September 17, 1979.

(2) If the offshore facility is not in existence on September 17, 1979, apply for a Certificate of Financial Responsibility at least 45 days before placing the offshore facility into operation or coverage becomes effective.

(3) If submitting an application to include an additional facility under previously established evidence of financial responsibility, apply for a Certificate of Financial Responsibility as early as possible before the anticipated date of desired coverage.

(b) Each application for a Certificate of Financial Responsibility must be made on a Coast Guard prescribed Application for Certificate of Financial Responsibility form, available from the Fund Administrator or any Coast Guard District Office. This form must be submitted for each facility; however, if evidence of financial responsibility has been previously established in an amount sufficient to meet § 135.203 (a), no additional evidence need be submitted with the application.

(c) Each application form submitted under this section must be signed by the applicant. A written statement proving authority to sign must also be submitted where the signer is not disclosed as an individual (sole proprietor) applicant, a partner in a partnership applicant, or a director or other officer of a corporate applicant.

(d) Financial data or other information submitted under this section that is proprietary in nature, or constitutes a trade secret, must be clearly designated as such to insure confidential treatment by the Fund Administrator, under 5 U.S.C. 552, the Freedom of Information Act, which provides for exemption from disclosure of trade secret data.

(e) If any of the information submitted for certification is determined by the Fund Administrator to be insufficient the Fund Administrator may require additional information before final consideration of the application.

(f) Certificates, as issued, are to be considered property of the U.S. Government, are not to be altered in any manner, and must be surrendered on demand when revoked in accordance with § 135.223 of this subpart.

(g) Applicants shall obtain a Certificate of Financial Responsibility for each facility.

§ 135.219 Notification of changes affecting certification.

(a) Each owner, operator, or guarantor of an offshore facility shall within ten days notify the Fund Administrator in writing when any changes occur which prevent the owner, operator, or guarantor, from meeting the obligations for which a Certificate of Financial Responsibility has been issued.

(b) Based on notice of a change in financial capability under paragraph (a) of this section, the Fund Administrator may revoke a Certificate of Financial Responsibility.

§ 135.221 Reapplication for certification.

(a) If a Certificate of Financial Responsibility becomes invalid for any reason, an application for a new certificate must be immediately submitted to the Fund Administrator in accordance with § 135.204.

§ 135.223 Certificates, denial or revocation.

(a) A certificate may be denied or revoked for any of the following reasons:

(1) Making any willfully false statement to the Fund Administrator in connection with establishing or maintaining evidence of financial responsibility.

(2) Failure of an applicant or certificant to establish or maintain evidence of financial responsibility as required by the regulations in this subpart.

(3) Failure to comply with or respond to inquiries, regulations, or orders of the Fund Administrator concerning establishing or maintaining evidence of financial responsibility.

(4) Failure to timely file the reports or documents required by § 135.213 (c) and (d).

(5) Cancellation or termination of any insurance policy, surety bond, indemnity, or guaranty issued under this subpart or modification thereto which reduces the financial capacity of the applicant or certificant to meet the requirements of this subpart, unless substitute evidence of financial responsibility has been submitted to and accepted by the Fund Administrator.

(b) Denial or revocation of a certificate shall be immediate and without prior notice in a case where the applicant or certificant—

(1) Is no longer the owner or operator of the offshore facility in question;

(2) Fails to furnish acceptable evidence of financial responsibility in support of an application, or

(3) Permits the cancellation or termination of the insurance policy, surety bond, indemnity, or guaranty upon which the continued validity of the certificate is based.

(c) In any other case, before the denial or revocation of a certificate, the Fund Administrator advises the applicant or certificant, in writing, of the intention to deny or revoke the certificate, and shall state the reason therefor.

(d) If the reason for an intended revocation is failure to file the reports or documents required by § 135.213 (c) and (d) the revocation shall be effective 10 days after the date of receipt of the notice of intention to revoke, unless the certificant shall, before revocation, submit the required material or demonstrate that the required material was timely filed.

(e) If the intended denial or revocation is based upon one of the reasons in paragraphs (a)(1) or (a)(3) of this section, the applicant or certificant may request, in writing, a hearing to show that the applicant or certificant is in compliance with this subpart. If the applicant or certificant fails to file a timely request for a hearing, the denial or revocation is effective 10 days after receipt of the notice.

(f) If a request for a hearing under paragraph (e) of this section is received by the Fund Administrator within 10 days after the date of receipt of a notice of intention to deny or revoke, the Fund Administrator grants a hearing and notifies the requesting party of the date, time, and location of the hearing. If a requesting party fails to enter an appearance at the scheduled hearing, or in lieu thereof fails to submit written evidence for the consideration of the hearing official, denial or revocation is effective as of the scheduled date and time of the hearing, unless an extension of time is granted by the Fund Administrator for good cause shown.

(g) Hearings under this section are informal and are conducted by an official designated by the Fund Administrator. The official conducting the hearing considers all relevant material submitted and makes recommendations to the Fund Administrator.

(h) The Fund Administrator's decision is final agency action.

Subpart D—Notification Designation and Advertisement

§ 135.301 Purpose.

(a) This subpart prescribes the requirements concerning notification of pollution incidents, source designa-

tion, and advertisement of designations.

§ 135.303 Definitions.

(a) As used in this subpart—

(1) "Advertisement" means the dissemination of information, including methods other than paid advertisements, that advises the public how to contact the designated source of pollution or the Fund to initiate a claim for economic loss.

(2) "Designated source" means a vessel or offshore facility which has been designated by the Commandant as a source of oil pollution.

(3) "Occurrences which pose an imminent threat of oil pollution" means those incidents that are likely to result in a discharge of oil and include, but are not limited to: vessel collisions, grounding or stranding; structural failure in a tank, pipeline or other oil handling system; fire, explosion or other events which may cause structural damage to a vessel or offshore facility.

NOTIFICATION

§ 135.305 Notification procedures.

(a) The person in charge of a vessel or offshore facility that is involved in an incident, including occurrences which pose an imminent threat of oil pollution shall, as soon as that person has knowledge of the incident, immediately notify by telephone, radio telecommunication or a similar rapid means of communication, in the following order of preference—

(1) (Within or offshore of the 48 contiguous States only) The Duty Officer, National Response Center, U.S. Coast Guard, 400 Seventh Street SW., Washington, D.C. 20590, toll free telephone number 800-424-8802; or

(2) The commanding officer or supervisor of any Coast Guard Marine Safety Office, Captain of the Post Office, Marine Safety Detachment or Port Safety Detachment in the vicinity of the incident; or

(3) The commanding officer or officer in charge of any other Coast Guard unit in the vicinity of the incident; or

(4) The Commander of any Coast Guard District.

(b) Notification given in accordance with this subpart constitutes fulfillment of the requirements of Subpart C of 33 CFR Part 153 concerning Notice of the Discharge of Oil.

§ 135.307 Notification contents.

(a) In each notification provided under § 135.305, the person in charge of the vessel or offshore facility involved in the incident shall provide his or her name and telephone number, or radio call sign, and, to the extent known, the—

(1) Location, date and time of the incident;

(2) Quantity of oil involved;

(3) Cause of the incident;

(4) Name or other identification of the vessel or offshore facility involved;

(5) Size and color of any slick or sheen and the direction of movement;

(6) Observed on scene weather conditions, including wind speed and direction, height and direction of seas, and any tidal or current influence present;

(7) Actions taken or contemplated to secure the source or contain and remove or otherwise control the discharged oil;

(8) Extent of any injuries or other damages incurred as a result of the incident;

(9) Observed damage to living natural resources; and

(10) Any other information deemed relevant by the reporting party or requested by the person receiving the notification.

(b) The person giving notification of an incident must not delay notification to gather all required information and must provide any information not immediately available when it becomes known.

DESIGNATION

§ 135.309 Notice of Designation.

(a) Upon learning of an incident which involves oil pollution, the Commandant designates, where possible, the source of the oil pollution and so notifies the owner, operator and any guarantor.

(b) Designation is made by a written Notice of Designation containing, to the extent known:

(1) The name of the vessel or offshore facility being designated as the source of oil pollution;

(2) The location, date, and time of the incident;

(3) The quantity of oil involved;

(4) The procedures for accepting or denying the designation;

(5) The initial requirements of advertising, if any, and

(6) The name, address and telephone number of the responsible Federal official to whom further communication regarding the incident, advertisement of the incident, or denial of designation should be directed.

§ 135.311 Denial of designation.

(a) The owner, operator or guarantor of a designated source may deny a designation within five days after receipt of a written Notice of Designation.

(b) A denial of designation must be in writing and—

(1) Identify the Notice of Designation; and

(2) Be submitted to the official named in the Notice of Designation.

(c) Failure to deny a designation does not, in and of itself, constitute acceptance of liability under the Act for losses resulting from the incident described in the Notice of Designation.

ADVERTISEMENT

§ 135.313 Advertisement determinations.

(a) The Commandant shall determine whether each incident has caused, or is likely to cause, economic loss covered by section 303 (a) of the Act. Where such loss has occurred or is likely to occur, the type, scope, and frequency of advertisement required shall be determined as provided in paragraph (b) of this section.

(b) In making the determination specified in paragraph (a) of this section, the Commandant considers—

(1) The nature and extent of economic losses that have occurred or are likely to occur;

(2) The persons who are likely to incur economic losses;

(3) the geographical area that is or is likely to be affected;

(4) The most effective method of reasonably notifying potential claimants of the designation and procedures for submitting claims; and

(5) Any relevant information or recommendations submitted by the owner, operator or guarantor of the designated source.

(c) The Commandant provides, in writing, the specific requirements for advertising for each pollution incident to the designated representatives of the owner, operator, or guarantor.

§ 135.315 Types of advertisement.

(a) Advertisement required by this subpart shall be made by one or more of the following means:

(1) Paid advertisement in a newspaper, or newspapers, having general circulation in the area designated by the Commandant;

(2) A public service announcement on commercial radio and television stations serving the area designated by the Commandant, when such services are available;

(3) Notice posted in marinas, marine supply stores, bait and tackle shops and other appropriate business establishments or public facilities in the area designated by the Commandant;

(4) News release to all newspapers, radio and television stations serving the area designated by the Commandant; and

(5) Publication in the Notice to Mariners.

§ 135.317 Frequency and geographical scope of advertisement.

(a) The frequency and geographical coverage of advertisement depends upon the circumstances of each inci-

dent and will be specified by the Commandant.

(b) When required, the substance of the required advertisement will be published in at least four successive issues of the Local Notice to Mariners.

§ 135.319 Content of advertisement.

(a) Each advertisement required by this subpart must specify the—

(1) Location, date, and time of the incident;

(2) Geographical area affected, as determined by the Commandant;

(3) Quantity of oil involved;

(4) Name or other description of the source designated by the Commandant;

(5) Identity of the owner, operator or guarantor of the source;

(6) Name, address, telephone number, office hours and work days of the person or persons to whom claims are to be presented and from whom claim information can be obtained.

Subpart E—Access, Denial, and Detention

§ 135.401 Access to vessel Certificates of Financial Responsibility.

(a) The owner, operator, master or agent of any vessel subject to the Act shall, upon request by any Coast Guard officer or petty officer, permit access to the vessel and produce for examination the Certificate of Financial Responsibility.

§ 135.403 Sanctions for failure to produce vessel Certificates of Financial Responsibility.

(a) The Captain of the Port issues denial or detention orders to the owner, operator, agent, or master of any vessel that cannot show upon request a valid Certificate of Financial Responsibility issued under the Act.

(b) A denial order forbids entry of any vessel subject to the Act to any port or place in the United States or to the navigable waters of the United States.

(c) A detention order detains any vessel subject to the Act at the port or place in the United States from which it is about to depart for any other port or place in the United States.

(d) The Captain of the Port terminates a denial or detention order when the owner, operator, agent, or master of a vessel furnishes adequate evidence that the certification of financial responsibility requirements under the Act have been met.

§ 135.405 Appeal provisions.

(a) The owner, operator, agent or master of a vessel issued a denial or detention order under this subpart may petition the District Commander in any manner to review that order.

(b) Upon completion of review, the District Commander affirms, sets aside, or modifies the order.

(c) Unless otherwise determined by the District Commander a denial or detention order remains in effect pending the outcome of any petition or appeal of that order.

(d) The District Commander acts on all petitions or appeals within 10 days of receipt.

(e) The decision of the District Commander is final agency action.

PART 136—OFFSHORE OIL POLLUTION COMPENSATION FUND, CLAIMS PROCEDURES

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AUTHORITY: Title III, Pub. L. 95-372, 92 Stat. 670 (43 U.S.C. 1811 et seq.); 49 CFR 1.46.

Subpart A—Introduction

§ 136.1 Purpose.

(a) This part prescribes uniform procedures and standards for the settlement of claims against the Offshore Oil Pollution Compensation Fund (the Fund) for economic loss, including removal costs, resulting from or arising out of oil pollution from certain Outer Continental Shelf activities as authorized by and in accordance with Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (Pub. L. 95-372; 43 U.S.C. 1811-1824).

§ 136.3 Information.

(a) Any person who desires to file a claim against the Fund may obtain information from the Administrator, Offshore Oil Pollution Compensation Fund, U.S. Coast Guard Headquarters (G-W/73), 400 Seventh Street SW., Washington, D.C. 20590.

§ 136.5 Definitions.

(a) As used in this part, the following terms shall have the same meaning as defined in section 301 of Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (Pub. L. 95-372): "claims"; "cleanup costs"; "damages"; "foreign claimant"; "Fund"; "guarantor"; "incident"; "offshore facility"; "oil pollution"; "operator"; "owner"; "person"; "property"; "removal costs"; "State"; "United States"; "United States claimant"; and "vessel".

(b) As used in this part—

(1) "Act" means Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (Pub. L. 95-372, 43 U.S.C. 1811-1824), entitled "Offshore Oil Spill Pollution Fund".

(2) "Administrative Law Judge" means any person designated by the Commandant under 5 U.S.C. 3105 and assigned to hear and resolve disputed claims in accordance with section 307 [i] of the Act.

(3) "Commandant" means the Commandant of the Coast Guard or that person's authorized representative.

(4) "Fund Administrator" means the person to whom the authority and functions of the Commandant as administrator of the Fund are delegated.

"Fund Claims Adjuster" means a person authorized to receive, review, adjust, and pay claims on behalf of the Fund.

(6) "Natural resources" means land, fish, wildlife, biota, air, water, and other such resources belonging to, managed by, held in trust by, appertaining to or otherwise controlled by the United States (including the resources of the fishery conservation zone established by the Fishery Conservation and Management Act of 1976), any state or local government, or any foreign government.

(7) "Oil" means petroleum, including crude oil or any fraction or residue therefrom and natural gas condensate, except that the term does not include natural gas.

(8) "Outer Continental Shelf" means "outer Continental Shelf" as defined in section 2(a) of the Outer Continental Shelf Lands Act (43 U.S.C. 1331(a)).

(9) "Panel" means a three member panel appointed by the Secretary of Transportation in accordance with section 307(h) of the Act.

§ 136.7 Foreign claims.

(a) Claims may be presented by foreign claimants for economic loss, except for loss of tax revenues, to the same extent that compensation for economic loss may be claimed by any United States claimant when the conditions of section 303(b)(6) of the Act are met.

(b) Foreign claims must be submitted in accordance with the regulations of this part and any additional instructions of the Fund Administrator.

(c) Before any foreign claim may be paid, the Fund Administrator certifies that the foreign claim is appropriate for consideration by the Fund.

Subpart B—General

Timeliness

§ 136.101 Time limitation on claims.

(a) A claim will not be considered by the Fund unless presented, in writing, to the Fund within three years of discovery of the economic loss for which compensation is sought or within six years of the date of the incident which resulted in the loss, whichever is earlier.

(b) When necessary to meet this section, a claim may be presented to the Fund even though the claim has been presented to and is under consideration by the owner, operator, or guarantor of a designated source, or other person.

(c) A claim is presented on the date the claim is actually received by a Fund Claims Adjuster or Fund Administrator.

Presentment

§ 136.103 Federally authorized removal costs.

(a) Claims for federally authorized removal costs incurred under subsection (c), (d), or (1) of section 311 of the Federal Water Pollution Control Act, and section 5 of the Intervention on the High Seas Act must be presented to the fund established by section 311(k) of the Federal Water Pollution Control Act (33 U.S.C. 1251-1376) in accordance with the regulations of Subpart D of 33 CFR, Part 153.

§ 136.105 Other claims.

(a) If the source of pollution is known, claims must be presented to the owner, operator, or guarantor of the source, except where the Fund Administrator has advertised or otherwise notified claimants and potential claimants that the claims may be presented to the Fund.

(b) A claim presented to the owner, operator, or guarantor of the source of pollution which is denied for any reason or not settled by payment within sixty days may be presented to the Fund.

(c) A claim may be presented to the Fund when the source of pollution is not known.

§ 136.107 Presenting claims to the Fund.

(a) A claimant must present a claim to the Fund by making the claim personally at, or by delivering or mailing the claim directly to the Fund Claims Adjuster, if known. If the Fund Claims Adjuster is not known, the claim may be submitted to the Fund Administrator who will forward it to the appropriate adjuster.

§ 136.109 Referral of unsettled claims.

(a) A claimant may present any claim not satisfied under § 136.105(b) by requesting the owner, operator, or guarantor to whom the claim has been presented to refer the claim to the Fund.

(b) The owner, operator, or guarantor shall, within seven days of receiving a request under paragraph (a) of this section, forward the entire claim file directly to the Fund Claims Adjuster specified by the Fund Administrator.

§ 136.111 Form.

(a) A claim must be in writing and include the amount claimed.

(b) Whenever practicable, a claimant should submit a claim in the format specified and on the forms provided by the Fund Claims Adjuster.

(c) Each claim must be signed in ink by the claimant or an authorized agent or legal representative of the claimant.

(d) A claim presented by an agent or legal representative must be presented in the name of the claimant, showing the title or legal capacity of the agent or representative.

§ 136.113 Subrogation.

(a) The claims of subrogor (insured) and subrogee (insurer) for damages arising out of the same incident constitute a single claim.

(b) A subrogor and subrogee may file a claim jointly or individually. If a joint claim is made, it must be signed by all parties in interest.

(c) A fully subrogated claim is payable only to the subrogee.

(d) A subrogee must support a claim in the same manner as any other claimant.

Contents

§ 136.115 Proof.

(a) A claimant seeking damages must establish—

(1) The nature and extent of economic loss incurred;

(2) When and how the economic loss was incurred;

(3) That the cause of the economic loss was oil pollution;

(4) That the source of the oil pollution was an offshore facility or vessel; and

(5) The actions taken to avoid or minimize the effects of the oil pollution.

(b) A claimant seeking cleanup costs must establish that the cleanup costs incurred were the consequence of or in response to an incident.

§ 136.117 Evidence.

(a) A claimant must submit evidence in support of each claim.

(b) A sworn statement of the claimant may be accepted when other evidence is not available.

§ 136.119 Multiple items of damage.

(a) A claimant must include all known losses arising out of a single incident or from the same oil pollution when submitting a claim.

(b) Each separate type of loss (as described in Subpart C of this part) must be separately listed.

(c) In the discretion of the Fund Administrator each separate type of loss may be treated separately for settlement purposes.

§ 136.121 Insurance.

(a) A claimant must provide the following information concerning any insurance owned by the claimant which

may cover the loss for which compensation is claimed.

(1) The names and addresses of insurers;

?) The kind and amount of cover-

,3) The policy number;

(4) Whether a claim has been or will be presented to an insurer, and if so, the amount of the claim and the name of the insurer; and

(5) Whether any insurer has paid the claim in full or in part, or has indicated whether or not payment will be made.

§ 136.123 Other compensation.

(a) A claimant must include with each claim an accounting, including source and value, of all other compensation received as a consequence of the incident out of which the claim arises including, but not limited to, monetary payments, goods or services, or other benefits.

§ 136.125 Costs incident to claim preparation.

(a) Costs necessarily incurred in the preparation of a claim may be included in the claim.

(b) Compensation may be allowed for reasonable, necessary, costs of claim preparation.

SETTLEMENT AND NOTICE TO CLAIMANT

36.127 Payment.

.) Payment is made as soon as pos-.ie when a claim is approved in full or an offer of settlement is accepted.

(b) Whenever a claim is not approved in full, the claimant is notified in writing of the settlement offer. Acceptance of the settlement offer must be in writing.

(c) The acceptance of an offer in settlement is final and conclusive for all purposes and, upon payment, constitutes a release of the Fund for the claim.

(d) Failure to accept an offer of settlement within thirty days constitutes rejection of the offer.

§ 136.129 Denial of claim.

(a) A claimant will be notified in writing whenever a claim against the Fund is denied, including when denial results from rejection, by the claimant, of an offer of settlement.

(b) The notification of paragraph (a) of this section includes a statement of the claimants right to further review of the claim.

(c) A claimant may consider a claim not settled within sixty days of receipt by a Fund Claims Adjuster as being ·d for purposes of administrative

Subpart C—Procedures for Particular Losses

INJURY TO, DESTRUCTION OF OR LOSS OF USE OF PROPERTY

§ 136.201 Authorized claimants.

(a) A claim for injury to or destruction of real or personal property, which may include loss of use of the property, or a claim for loss of use of real or personal property which is not damaged, may be presented by any person either owning or leasing the property.

§ 136.203 Proof.

(a) A claimant must establish an ownership, rental, or leasehold interest in the property.

(b) For each claim for injury to, or destruction of, property the claimant must establish—

(1) That the property was injured or destroyed;

(2) The cost of repair or replacement; and

(3) The value of the property both before and after injury occurred, if the cost of repairs exceeds replacement cost.

(c) For each claim for loss of use of property, the claimant must establish—

(1) That the property was not available for use;

(2) Whether or not substitute property was available and utilized, and the costs thereof; and

(3) The economic loss incurred as a result of the loss of use of the property.

§ 136.205 Compensation allowed.

(a) The measure of damages for injured property is the actual or estimated net cost of repairs necessary to restore the property to substantially the condition which existed immediately before injury.

(b) If the actual or estimated net cost of repairs exceeds the value of the property immediately before injury less the value immediately after injury, the measure of damages is the value of the property immediately before injury less the value immediately after injury.

(c) Compensation for loss of use of property may be allowed for reasonable costs, actually incurred, for use of substitute property or, if substitute property was not reasonably available, for the amount of the net economic loss which resulted from not having use of the property. When substitute property was reasonably available, but not used, compensation for loss of use is not payable.

LOSS OF INCOME DUE TO INJURY TO, OR DESTRUCTION OF, PROPERTY OR NATURAL RESOURCES

§ 136.207 Authorized claimants.

(a) A claim for loss of profits or impairment of earning capacity due to injury to, or destruction of, real or personal property or natural resources may be presented by any person deriving at least 25 per cent of his or her annual income from activities which utilize, or are related to the utilization of, the property or natural resource.

(b) A person who either owns or leases property which is injured or destroyed is not a proper claimant under paragraph (a) of this section. That person should claim under § 136.201.

(c) A person who uses natural resources directly is not a proper claimant under paragraph (a) of this section. That person should claim under § 136.219.

§ 136.209 Proof.

(a) The claimant must establish—

(1) That property or natural resources have been injured or destroyed;

(2) That 25 per cent of the claimant's income, on an annual basis, is derived from activities which utilize, or are related to the utilization of, the injured or destroyed property or natural resources;

(3) That the claimant's income from these activities was reduced as a consequence of injury or destruction of the property or natural resources; and

(4) Whether or not substitute employment, or business, was available and undertaken and, if so, the amount of income received.

§ 136.211 Compensation allowed.

(a) Compensation is limited to the reduction or loss of earnings or profits suffered but is not allowed for lost employment or business when appropriate substitute employment or business was available but not undertaken.

(b) If substitute employment or business was undertaken, any resulting reduction in earnings or profits may be allowed.

INJURY TO, OR DESTRUCTION OF, NATURAL RESOURCES

§ 136.213 Authorized claimants.

(a) A claim for injury to, or destruction of, natural resources may be presented by—

(1) A Federal agency designated by the President, as trustee, for those natural resources over which the United States has sovereign rights or exercises exclusive management authority; or

(2) Any State, for natural resources within the boundary of the State be-

longing to, managed by, controlled by, or appertaining to the State.

§ 136.215 Proof.

(a) A claimant must establish—

(1) The identification and quantity of the natural resource for which compensation is claimed;

(2) The nature and extent of the injury to the natural resource;

(3) The cost to restore or replace the natural resource; and

(4) Any economic loss relating to the natural resource which would not be recovered by replacement or restoration.

§ 136.217 Compensation allowed.

(a) The amount of compensation is based on—

(1) The cost to restore, rehabilitate, or acquire the equivalent of the natural resource; and

(2) Any additional associated economic loss actually suffered.

LOSS OF USE OF NATURAL RESOURCES

§ 136.219 Authorized claimants.

(a) A claim for loss of use of natural resources may be presented by any person who incurs economic loss as a result of not being able to directly use any natural resource.

§ 136.221 Proof.

(a) A claimant must establish—

(1) The identification of the natural resource for which compensation for loss of use is claimed;

(2) The activity which the loss of use of the natural resource prevented or affected;

(3) An explanation of how the use of the natural resource was affected;

(4) Alternatives to the activity and whether or not utilized, and if so, how, and with what result; and

(5) The economic loss suffered.

§ 136.223 Compensation allowed.

(a) The amount of compensation allowed is the net economic loss incurred except that compensation is not allowed to the extent that reasonable alternatives to the affected activity were available but not utilized.

CLEANUP COSTS

§ 136.225 Authorized claimants.

(a) A claim for cleanup costs may be presented by any person.

§ 136.227 Proof.

(a) A claimant must establish—

(1) The actions taken to prevent, minimize, or mitigate oil pollution;

(2) The costs and other economic loss incurred as a result of these actions; and

(3) Why the actions were taken.

§ 136.229 Compensation allowed.

(a) The amount of compensation allowed is the total of reasonable costs and other economic loss incurred.

(b) Except for action taken with respect to property owned, leased, or otherwise subject to the supervision, management, or use of the claimant, voluntary actions will not ordinarily be compensated.

LOSS OF TAX REVENUE DUE TO INJURY TO PROPERTY

§ 136.231 Authorized claimants.

(a) A claim for loss of tax revenue may be presented on behalf of the United States, or any State or political subdivision thereof with authority to assess and collect taxes, by the official charged with the responsibility and authority for collecting these taxes.

§ 136.233 Proof.

(a) A claimant must establish—

(1) The identification and description of the tax for which compensation is claimed, including authority and regulations, property affected, method of assessment, rate, and method and dates of collection;

(2) That a consequence of the oil pollution was a reduction in tax revenue;

(3) The total tax assessment or tax revenue collected for the tax period before injury occurred; and

(4) The net loss of revenue.

§ 136.235 Compensation allowed.

(a) The amount of compensation allowed is the total tax revenue actually lost during the one year period following the oil pollution incident.

Subpart D—Administrative Review of Claims

§ 136.301 General.

(a) Administrative review of the denial of a claim is either by panel or administrative law judge in accordance with the Administrative Procedure Act (5 U.S.C. 554), section 307 of the Act, and these regulations.

§ 136.303 Initiation of Administrative review.

(a) A claimant must initiate review of a claim by written notice, within 30 days of the denial of a claim, to the Fund Administrator, for forwarding to the Commandant.

(b) Upon receipt of a request for review of a claim the Commandant refers the claim to an administrative law judge or recommends to the Secretary of Transportation that the claim be referred to a panel. If the Secretary does not refer the claim to a panel, the claim is returned to the Commandant for referral to an administrative law judge. The Commandant notifies the claimant of the action taken.

(c) The Fund Administrator may reconsider any claim at any time before a claim is referred to an administrative law judge or panel.

§ 136.305 Procedures.

(a) The administrative law judge, or presiding officer of a panel, is responsible for all proceedings for review of a claim and, may—

(1) Administer oaths and affirmations;

(2) Issue subpenas;

(3) Adopt procedures for the submission of evidence;

(4) Rule on offers of proof and receive evidence;

(5) Dispose of procedural requests and similar matters; and

(6) Convene, recess, reconvene, adjourn, and otherwise regulate the hearing.

(b) An informal, preliminary conference is held, in advance of the hearing, presided over by the administrative law judge, or presiding officer, to narrow the issues and otherwise discuss the specific matters in dispute.

(c) A verbatim record is made of the hearing. A transcript is not prepared unless either an appeal is taken or the administrative law judge, or presiding officer, specifically so orders. If a transcript is either required or desired for further review of the claim the moving party must order and pay for the original transcript for use by the reviewer. The parties are responsible for obtaining copies of the transcript for their own use.

(d) The administrative law judge, or panel, promptly renders a decision following the close of the proceedings.

(e) The decision of the administrative law judge, or panel, constitutes final agency action, unless, within 30 days of the decision, review under § 136.309 has been directed.

§ 136.307 Subpenas.

(a) The administrative law judge, or presiding officer, may issue subpenas for the attendance and the giving of testimony by witnesses or for the production of any relevant evidence either upon motion by the administrative law judge, or presiding officer, or upon request of either the claimant or Fund.

(b) Each subpena bears the name "Offshore Oil Pollution Compensation Fund" and the name and address of the issuing administrative law judge or presiding officer and commands the person to whom it is directed to testify at a specified time and place or to produce at a specified time and place books, papers, documents, or any other evidence described in the subpena with the particularity necessary to identify what is desired.

(c) Service of a subpena shall be by personal service, or by certified mail with return receipt to be signed by the addressee only. Proof of service, or an explanation of the lack of service, shall consist of appropriate endorsement upon a copy of the subpena, and shall be delivered to the administrative law judge, or presiding officer.

(d) The person to whom a subpena is directed may apply to the administrative law judge, or presiding officer, in writing, to request that the subpena be quashed or modified. The administrative law judge, or presiding officer, promptly considers and rules on the request. The request must be made at least five days before appearance is required or documents must be produced.

(e) Subpenaed witnesses are entitled to the same fees and mileage allowance as witnesses subpenaed by District Courts of the United States. These witness expenses are reimbursable by the Fund, to be paid by the Fund Administrator, if and when certified by the administrative law judge, or presiding officer, as costs necessary to settle claims against the fund.

(f) If the administrative law judge, or presiding officer, rules that good cause has been shown for seeking judicial enforcement of a subpena, the ruling is referred to the United States District Court for enforcement.

§ 136.309 Review of administrative determination.

(a) Either the claimant or the Fund may petition the Secretary of Transportation, in the case of administrative review by panel, or the Commandant, in the case of administrative review by administrative law judge, for further review. Review is granted at the discretion of the Secretary or Commandant, as appropriate.

(b) A petition under paragraph (a) of this section must—

(1) Be in writing;

(2) Be made within 15 days of the decision of the administrative body; and

(3) Specify the issues in dispute and the basis for the appeal.

(c) Either the Secretary of Transportation, for a claim reviewed by a panel, or the Commandant, for a claim reviewed by an administrative law judge, may, on their own initiative, review the decision of the administrative body.

Effective date: These regulations are effective on March 17, 1979.

Dated: March 14, 1979.

J. B. HAYES,
Admiral, U.S. Coast Guard
Commandant.

[FR Doc. 79-8255 Filed 3-16-79; 8:45 am]

APPENDIX G

FISHERMEN'S CONTINGENCY FUND

Thursday
January 24, 1980

Part X

Department of Commerce

National Oceanic and Atmospheric Administration

Fishermen's Contingency Fund

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 296

Fishermen's Contingency Fund

AGENCY: National Marine Fisheries Service/National Oceanic and Atmospheric Administration, Commerce.

ACTION: Final regulations.

SUMMARY: These regulations implement Title IV of the Outer Continental Shelf Lands Act Amendments of 1978 (92 Stat. 629, Pub. L. 95–372, 43 U.S.C. Section 1841 *et seq.* (Title IV).) Title IV establishes a Fishermen's Contingency Fund (Fund) to compensate fishermen for eligible claims for actual and consequential damages, including lost profits, due to damages to, or loss of, fishing vessels or fishing gear by items associated with oil and gas exploration, development, or production on the Outer Continental Shelf (OCS). These regulations establish procedures for administering the Fund, and for filing, processing, reviewing, adjudicating and paying claims.

EFFECTIVE DATE: Sections 296.1 through 296.3, §§ 296.5 through 296.9 and § 296.15 are effective on January 24, 1980. Section 296.4 and §§ 296.11 through 296.14 are effective February 25, 1980. Any lease, exploration permit, easement or right-of-way in effect on January 24, 1980 shall be assessed under §§ 296.4 (a) and (c)(1).

FOR FURTHER INFORMATION CONTACT: Mr. Michael L. Grable or Ms. Kathryn E. Hensley, Financial Services Division, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Washington, D.C. 20235, Telephone (202) 634–4688.

SUPPLEMENTARY INFORMATION:

I. Response to Public Comments.

A notice of proposed rulemaking for implementation of the Fund was published on May 24, 1979, (44 FR 30292). We received a number of detailed comments in response to the notice of proposed rulemaking. Many comments raised questions or made suggestions which have resulted in changes in these final rules. The comments and the resulting changes in these final rules are discussed below.

A. Section 296.2. Definitions

"Area affected by Outer Continental Shelf exploration, development or production activities." The proposed definition included any area of the OCS in which such activities "have taken place or are taking place."

Comment: One commenter stated that this definition is too broad and bears no reasonable relationship to areas in which oil and gas obstructions might be encountered. Each area should be defined by coordinates and landward areas should be limited to specified traffic corridors leading to areas where oil or gas activities are taking place or to pipeline corridors.

Response: The definition is important, since it controls one of the criteria of a claim's presumed cause. In order to more realistically limit availability of the presumption of causation to probable areas of OCS oil and gas related obstructions, these final rules have been changed to redefine the term as any area which is: (1) Under oil and gas lease on the OCS, (2) within one-half geographical mile of a lease, pipeline, easement or right-of-way on the OCS, or (3) otherwise associated with OCS oil and gas activities (such as expired lease areas, relinquished rights-of-way and easements, and areas used extensively by surface vessels supporting oil and gas activities). Determinations about the third part of the redefined term will be made on a case-by-case basis by the Chief, Financial Services Division, NMFS, based upon information supplied by the Department of the Interior. The Chief's decision is subject to review by an administrative law judge (ALJ).

"Commercial Fishing Vessel"

The term "commercial fishing vessel," as defined in the proposed regulations, inadvertently included recreational fishing vessels.

Comment: Commenters suggested the following changes to the definition:

Recreational fishermen fishing for their own consumption should be excluded;

Eligible commercial fishermen should be required to earn some minimum percentage of their livelihood from commercial fishing; and

Only casualties occurring when a commercial fishing vessel is being used for commercial fishing purposes should be eligible for compensation.

Response: Commercial passenger carrying fishing vessels are within the meaning of the term "commercial fishing vessel" as that term is defined in the Title IV statute. Fishing vessels operated for non-commercial recreational purposes are not within the statutory definition. The final rules have been changed to exclude recreational vessels.

"Holder."—The term "holder" was defined to mean the record holder of any lease, exploration permit, easement or right-of-way.

Comment: One commenter suggested the definition of the term "holder" should include such holder's assignee of rights or such "holder's" designated agent.

Response: These final rules have been changed as suggested by the comment.

"Respondent"—Sections 296.2, 296.4, 296.8, and 296.11 deal with the definition of "respondent," assessable persons, admission or denial of responsibility, and payment of costs.

Comment: Several commenters suggested that time limits should be established so that oil and gas companies are not perpetually exposed to assessments or other liabilities simply because they had operated in a particular area at some time in the past.

Response: Assessments for the purpose of funding the area accounts will be based by the Department of the Interior on current inventories of leases, easements, rights-of-way, and permits in effect. Abandoned, relinquished, cancelled, or otherwise non-effective leases, easements, rights-of-way, or permits will not be included for the purpose of assessment, but will be included in Interior's notices of claims and requests for admission or denial of responsibility. Additionally, the concept of a "respondent" has been replaced by a concept of an "interested person", as explained elsewhere in this Preamble.

B. Section 296.3. Fishermen's Contingency Fund

This section excludes from the geographical area of all area accounts any area under State, rather than Federal, jurisdiction.

Comment: One commenter suggested the final rules strike the phrase "any portion of the OCS which is" in § 296.3(b) and substitute "submerged lands" in its place.

Response: These final fules have been changed as suggested by the comment. Section 296.3(b) is redesignated as § 296.3(c).

In addition, the definition of "outer continental shelf" has been changed in these final regulations, to track the statutory definition in 43 U.S.C. section 1331.

Although the statutory definition is not very helpful to the average fisherman, NOAA believes the definition used in the proposed regulations could have created confusion in some cases about which geographic areas are assessed to pay into the Fund.

C. Section 296.4. Payments into the Fund

Reassessments to Maintain Accounts

Section 296.4(b) provides for reassessments when the amount remaining in any area account is less than one-half its total capitalizable amount.

Comment: Commenters suggested: Reassessment should occur whenever monies in an area account are insufficient to pay adjudicated claims; and

Reassessment should occur whenever monies in an area account are less than 90 percent of its total capitalizable cost.

Response: Since lack of monies to pay a claim would create a debt of the Fund, and since payment of reassessments is due within thirty days of billing, NOAA believes the present provisions are sufficient.

Calculation of Amount

Section 296.4(c) established the assessment for exploration permits at $25.00.

Comment: One commenter suggested that the proposed assessment for exploration permits was too low. At a fee of $25.00 per exploration permit, there would have to be 4,000 exploration permits to fund one area account at the 00,000 level.

Response: The concern is that there would be no way of adequately funding an area account prior to the time leasing and development or production takes place, since Fund income from exploration permits would be negligible. NOAA does not believe that this will be a significant problem. In these final rules the assessment for exploration permits is increased from $25.00 to $50.00 in order to better defray the cost of administering such assessments.

Comment: One commenter observed that § *296.4(c)(1)(iii)* allows escapement from assessment by new permits, leases, rights-of-way, or easements which come into existence between assessments, until the next assessment. The commenter apparently believes new permits, leases, rights-of-way, and easements should be assessed as soon as they exist.

Response: New assessments will occur whenever an area account's capital is less than $50,000. If claims are paid on a continuing basis from any area account, virtually all persons liable to pay assessments will eventually pay as reassessments are made. NOAA believes no change in these final rules is arranted.

Section 296.4(c)(1)(v) deals with the exclusion of certain flow and gathering lines from the assessment of pipeline easements.

Comment: One commenter suggested the word "operation" as it appears immediately before the period at the end of this section should be stricken and the word "operator" should be inserted in lieu thereof;

A second commenter suggested the phrase should read "under unitized operation or a single operation."

Response: These final rules have been changed to refer to either contiguous unitized leases or contiguous leases under a single operator.

Billing

Comment: One commenter suggested the Department of the Interior's assessment billing under § *296.4(d)* should include an itemized statement of assessment.

Response: The Department of the Interior intends each billing to contain an itemized statement of assessment. These final rules have been changed accordingly.

By Whom and When Payable

Section 296.4(e) requires assessments to be paid within thirty days after billing.

Comment: One commenter suggested that assessment payments should be due sixty days after the assessment.

Response: NOAA believes thirty days is a reasonable period for responding to a billing.

D. Section 296.5. Claims Eligible for Compensation

Damage or Loss of Fishing Gear

Section 296.5(b) deals with the type of damage eligible for Fund compensation and specifically provides that casualties occurring in waters under State jurisdiction may nevertheless be eligible for Fund compensation if the obstructions causing the casualties were associated with oil and gas exploration, development or production activities on the Federal Outer Continental Shelf.

Comment: One commenter suggested deleting the provision allowing Fund compensation for damage occurring in waters under State jurisdiction caused by obstructions related to Federal OCS oil and gas activities.

Response: Debris and other obstructions directly related to Federal OCS oil and gas activities might be deposited in waters under State jurisdiction. For example, a supply vessel bound for an OCS site may lose overboard, in waters under State jurisdiction, a large piece of equipment hazardous to commercial fishing operations. Additionally, the Fund's authorizing legislation provides that damage need not have occurred in the geographic area of a specific area account in order to be the liability of that area account. In many cases, however, the OCS-related nature of obstructions causing damage in waters under State jurisdiction will have to be specifically proven, since the presumption of causation contained in § 296.9(b) will apply to casualties occurring in waters under State jurisdiction only if that particular area is an "area affected by OCS exploration, development or production activities" (one of the criteria of the presumption's availability). No change in these final rules is warranted.

Exceptions

Section 296.5(c) restates the Title IV statute's requirement that claims are not eligible for Fund compensation in certain cases, including if the damages claimed are caused by items attributable to a "financially responsible party".

Comment: Commenters suggested: Claimants should be able to claim against the Fund as an alternative to litigation against financially responsible parties;

A denial of responsibility on the part of oil and gas companies notified by the Department of the Interior should, thereafter, enable claimants to collect from the Fund even if such companies are found by a hearing examiner (administrative law judge) to be responsible; and

Claimants should be allowed to recover compensation from the Fund even if financially responsible oil and gas companies admit responsibility for claimants' damages because it may be difficult to recover from oil and gas companies.

Response: The Fund's authorizing legislation makes damages attributable to financially responsible parties ineligible for compensation. No change in these final rules as to that issue is therefore permissible.

The final regulations define a "financially responsible party" as, generally, a financially solvent person who is responsible for damage to or loss of commercial fishing vessels or gear by items associated with OCS oil and gas activities. NOAA believes this definition is consistent with Congressional intent that the Fund not be an alternate remedy when the oil or gas—related company responsible for the damage is known and able to pay for the damage.

The final regulations also expand § 296.5(c), attempting to include in one list the Title IV statute's requirements prohibiting or limiting payment of awards by the Fund, and to cross-reference the statutory requirements to the appropriate sections of the final

regulations. E. section 296.6. *Amount of awards.*

Fishing Gear

Section 296.6(b) establishes replacement cost, less salvage value, as the measure of Fund compensation for irreparable fishing gear damage.

Comment: Commenters suggested using depreciated replacement cost or fair market value, rather than replacement cost less salvage value, as the measure of Fund compensation for irreparable fishing gear damage.

Response: We believe replacement cost less salvage value is the fairest criterion since (1) fishing gear often does not depreciate normally due to constant repair (for example, nets) and (2) a fair market value for different components of fishing gear is often impossible to establish. The final rules clarify that "replacement cost" means the cost of new fishing gear, without consideration of wear and tear on the damaged or lost gear.

Consequential damage

Comment: One commenter suggested there is a possibility that § 296.6(c) may allow consequential damages without actual damages.

Response: The only such possibility we can foresee is a claim for lost profits incurred as a result of disengaging fishing gear in such a way as to prevent actual damage of the gear involved. This will encourage claimants to mitigate or altogether avoid actual damages, but may result in damage in the form of lost profits as a result of such mitigation or avoidance. In response to an additional comment on this section, this type of consequential damage ordinarily will be limited to the replacement cost, minus salvage value, of the gear involved, unless the fisherman can show that his efforts to free the gear were reasonable and that abandonment of the gear would have resulted in greater economic loss (see final § 296.6(c)(2)(ii)).

Loss of Profits

Section 296.6(c)(2) limits claims for lost profits to a period of six months or less.

Comment: One commenter suggested claims for lost profits beyond six months should be allowed if a claimant can produce substantiating records.

Response: The Fund's authorizing legislation limits lost profits compensation to a maximum of six months. No change in these final rules is permissible.

Section 296.6(c)(2) also specifies that the ordinary measure of compensation is the net profits lost.

Comment: Commenters had the following suggestions: One commenter questioned how net profits will be determined and pointed out that certain fixed expenses continue whether vessels are fishing or not;

Crew members should not be able to claim compensation for their losses, either on their own or through vessel owners;

The determination of economic loss will be difficult. Income, for example, fluctuates greatly according to season, type of fishery, and what processors are willing to purchase. Income tax returns reflect aggregate annual income, which might be too low when applied to any specific activity at any specific point in a year. Fish tickets for a given period would more accurately reflect gross income for that period but would not contain evidence of expenses;

It will be difficult to determine income or profits in newly developing fisheries;

Compensation for economic loss should be based upon average performance for comparable quarters of at least two years prior to a casualty. The variable nature of fishing makes income averaging over longer periods the fairest method of measuring compensation for lost profits; and

Compensation for economic loss which includes profits greater than net profits is outside the purview of the Fund's authorizing legislation.

Response: The determination of reasonable compensation for economic loss will be difficult. Attempting to make fine distinctions might often result in a considerable expenditure of time and money on the part of the claimant, the Government, and the Fund. We believe, consequently, that a pre-hearing administrative standard should be established in the interest of efficiency.

Crew members' claims for economic loss are eligible under the Fund's authorizing legislation. To facilitate resolution of multiple claims resulting from one casualty, these final rules do suggest that the claims of all crew members be aggregated and submitted by the owner or operator on behalf of the crew members (see § 296.7(d)).

To facilitate resolution of claims, we intend to propose settlements and make other agency recommendations for economic loss compensation based upon the vessel owner or operator's latest Federal income tax return where such return reflects the operation of the vessel involved in the casualty, or a similar vessel. The annual net profit in such a return will be used to make a pro rata computation of the vessel owner or operator's loss of net profit for a reasonable period during which vessel operation was prevented by the casualty. The annual income and expense data in such a return will be used to compute the crew members' shares of lost profits (when crew member claims are filed relating to the casualty) according to the contractual share to which each crew member was entitled (see also § 296.7(e)(11)).

We believe this is a fair and efficient resolution of an otherwise difficult evidentiary problem. The claimant or an "interested person" disagreeing with the application of this standard has the opportunity, subject to certain standards, to present evidence at any hearing before an administrative law judge (ALJ) for the purpose of rebutting this standard for determining compensation in particular cases. The ALJ has the discretion to consider any and all other evidence in determining the measure of compensation for economic loss.

These final rules have been changed accordingly.

Other

Section 296.6(c)(3) of the proposed regulations allowed Fund compensation for consequential damage, including personal injury resulting from damaged fishing gear.

Comment: One commenter suggested deleting personal injury compensation because the Fund's authorizing legislation does not contemplate it.

Response: The Fund's authorizing legislation provides for "reasonable compensation for damages to, or loss of, fishing gear and any resulting economic loss to commercial fishermen". We agree that this language does not explicitly include compensation for personal injury. Additionally, compensation for personal injury is provided for in commercially available marine protection and indemnity insurance, and remedies are available under admiralty law. We believe that title IV was intended to provide compensation for damages not normally compensable under other systems of remedies. Accordingly, these final rules have been changed to exclude Fund compensation for personal injury.

Attorneys' fees

Section 296.6(d) authorizes Fund compensation of reasonable attorneys' fees.

Comment: Commenters submitted the following comments: Allow recovery of actual, rather than reasonable, attorneys' fees;

Make payment of attorneys' fees discretionary;

There should be no recovery for attorneys' fees if claim is unsuccessful; and

If claimant's claim is reduced to
lect claimant's contributory
igence, recovery for claimant's
rneys' fees should be reduced proportionately.

Response: It would not be proper under the Title IV statute to allow Fund compensation of actual, but unreasonable, attorneys' fees. The title IV statute requires payment of reasonable attorneys' fees if claimant is successful. We believe that reducing attorneys' fees proportionately to reflect reductions of claims due to claimant's contributory negligence is not in accordance with normal standards for computation of fees, and would be difficult to administer.

We agree that unsuccessful claimants should not recover attorneys' fees.

These final rules have been changed accordingly.

Negligence of claimant

Section 296.6(e) establishes negligence factors and provides for reduction of compensation based upon a comparative negligence standard.

Comment: The following comments were submitted: Claimants' duty to mitigate damages should be modified by inclusion of the word "diligently";

Claimant negligence should constitute
absolute bar to recovery, rather than
a partial bar under comparative
ligence theory;

Negligence factors should include (1) failure to abide by established rules of the road and (2) failure to use proper care. Oil and gas companies should be provided some legal protection against fishermen negligently damaging pipelines or subsea wells in such a way that materials from them subsequently become obstructions;

Claimants' negligence should be restricted to intentional acts;

The criterion for navigation safety zones is too general and should be more specifically defined with care being taken to assure that not too large an area is removed from traditional fishing grounds.

Response: These final rules have been changed to (1) require "due diligence" in the mitigation of damages and (2) include failure to use proper care and failure to abide by established rules of the road as additional negligence factors.

The comparative negligence standard is in the Title IV statute, and we do not agree that claimants' contributory negligence should be an absolute, rather than a partial, bar.

Providing oil and gas companies legal
tection against damage caused by
ishermen is outside the scope of the Fund's authorizing legislation. If, however, a fisherman's conflict with oil and gas property results in the spread of materials which subsequently become obstructions, some consolation is provided by the fact that a Fund claim for the first conflict probably will result in the obstruction site being charted or noted in Notices to Mariners, thereby likely removing it from the possibility of producing further Fund claims.

Navigational safety zones are established for the safety of all ocean users. Since they may vary with different conditions, the criterion should be kept general.

We see no good reason why unintentionally negligent acts should be excluded.

Section 296.6(e)(2)(ii) has been changed in these final rules to add the phrase "(casualties occurring within a one-quarter mile radius of obstructions so recorded or marked are presumed to involve negligence or fault of the claimant)". The effect of this change is to presume negligence or fault in the case of a vessel's incurring a casualty within a one-quarter mile radius of obstructions previously recorded on National Ocean Survey charts or in the Notice to Mariners, or marked by a buoy. This new provision may reduce, but usually will not eliminate, an award. The fishermen may provide evidence to show that his action was not negligent, or that the obstruction he encountered was not the one charted.

Comment: One commenter suggested that negligence of vessel owners or operators which bars or reduces their Fund claims should likewise bar or reduce claims from crew members relating to the same casualty.

Response: NOAA agrees that imputing the vessel owner or operator's negligence to the crew is reasonable. The Fund should not pay the crew for losses caused by such negligence. These final rules have been changed as suggested.

Insurance Proceeds

Section 296.6(f) disallows recovery from the Fund of any portion of a claim which will be covered by insurance and requires a claimant to first seek recovery from such insurance of that portion of the casualty which may be covered by such insurance.

Comment: One commenter suggested the rules should not require a claimant to first seek recovery from insurance.

Response: We do not believe Congress intended the Fund to become a substitute for currently available marine insurance. This section largely excludes from Fund compensation damage to vessels, since such damage is generally recoverable under commercially available marine insurance. Since, however, damage to fishing gear is not generally recoverable under such insurance, fishing gear damage generally would not be subject to the requirement first to seek recovery from insurance. The final rules require that claimants provide a copy of any insurance policies covering the vessel, so the Chief, FSD and the ALJ may determine whether the damage claimed may be compensable by insurance (see § 296.7(e)(13)).

F. Section 296.7. Instructions for filing claims

(a) Five-day report required to gain presumption of validity.

Section 296.7(a) requires the reports upon which the presumption of validity depends to be made within five days. In these final regulations, the presumption of "validity" is changed to a presumption of "causation" by obstructions associated with OCS oil or gas activities.

Comment: One commenter suggested increasing the time period of the report from five days to ten days.

Response: The Fund's authorizing legislation specifies only five days for the submission of the report. No change in these final rules is therefore permitted concerning this issue. The final regulations allow the owner or operator of the fishing vessel to file a five-day report on behalf of the entire crew, owner, and operator of the vessel.

Where to radiotelephone file the five-day report

Section 296.7(a)(3) of the proposed regulations established that five-day reports (required for the presumption of validity) must be made to specific National Marine Fisheries Service (NMFS) representatives at the NMFS Regional Offices.

Comment: One commenter stated claimants far distant from the NMFS Regional Offices would be unable to make contact by radiotelephone (the example given is a claimant in the Beaufort Sea trying to reach Juneau, Alaska, by radiotelephone). Other allowable reporting contacts should be: Coast Guard offices, local marine operators, or local National Marine Fisheries Service representatives;

Notification of Coast Guard by radio would be a better alternative, since radiotelephone reports are sometimes difficult or impossible when large incidence of radiotelephone traffic closer to shore blocks communication.

Response: Although it may sometimes prove difficult or impossible for a claimant to radiotelephone a National Marine Fisheries Service Regional

Office from the casualty site, some control must be maintained over the receipt of five-day reports if they are to serve their proper purpose. Since the world at large cannot be expected to be familiar with either the requirements of a five-day report or their proper processing, the report destination must be limited to the National Marine Fisheries Service. The Coast Guard informs NMFS that they are concerned that the message of traffic from Title IV claims might hinder their ability to conduct their primary functions, such as search and rescue. Accordingly, the final regulations require that the five-day report be made to the local NMFS Regional Office.

Section 296.7(a)(2)(ii) of the proposed regulations would have required claimants who had made five-day radiotelephone or oral reports to confirm them in writing within five days of their first return to port. This has been modified to strongly recommend (rather than require) that written confirmation be made to the Chief, Financial Services Division, NMFS, as soon as possible (see § 296.7(a)(3) of the final regulations).

Contents

Section 296.7(e)(10) deals with proof of ownership of damaged fishing gear, estimates of its replacement or repair cost, the facts of the damage or loss, etc.

Comment: Commenters submitted the following comments:

Owners of homemade nets will have difficulty proving possession because they do not have purchase invoices or sales receipts;

Provisions should be made to include reasonable value of makers' labor involved in homemade nets;

Claimants who cannot prove purchase or ownership of damaged fishing gear because they no longer have purchase invoices or sales receipts should be allowed to substitute affidavits from sellers; and

Lessees of fishing vessels or gear may have difficulty proving their lease rights.

Response: The best available evidence of possession or ownership must be submitted. Purchase invoices, sales receipts, income tax depreciation schedules, and the like are the best evidence. Where these are unavailable, affidavits from sellers, crew members, claimants, or other persons will be considered. Unwritten lease rights may be proven by an affidavit from the lessor.

Reasonable labor charges for net makers may be included, unless this is a normal duty for which crew members are compensated by their regular share of vessel income.

All comments can be accommodated by the section as presently written and no change in these final rules is warranted.

Section 296.7(e)(27) deals with acceptable means of fixing the position of obstructions causing loss or damage. The section specifically states that radar bearings are not an acceptable means to locate an obstruction.

Comment: One commenter stated radar bearings are accurate and should be an acceptable means of fixing the position of an obstruction;

A commenter suggested several technical errors be corrected.

Response: The most accurate method generally available for fixing positions is Loran C time delay readings, and § 296.7(e)(27) lists Loran C as the most preferable method. Other methods, in descending order of preference, are noted. Some of these other methods allow radar distance readings when used in conjunction with compass bearings to visually observed fixed objects. Radar bearings by themselves are, however, inadequate for fixing the position of obstructions since the radar equipment generally used aboard fishing vessels is not sophisticated enough to allow accurate position fixing by the use of radar bearings alone. The final regulations allow use of radar bearings alone only if no better method of position-fixing is available.

Certain technical errors have been corrected by appropriate changes in these final rules.

G. Section 296.8. NMFS processing of claims.

Public Notice of Claims.—Actions by the Chief, FSD

Section 296.8(d) of the proposed regulations specified when the Government will assign a hearing examiner to a Fund claim.

Comment: One commenter suggested the Government should determine that a Fund claim is valid with respect to the purposes of the Title IV statute before assigning an administrative law judge (ALJ). Another commenter suggested the establishment of a 5-day maximum period during which the Government must determine if a claim is complete and timely filed, assign an ALJ, and issue a notice.

Response: NOAA believes that the statute requires that the ALJ determine whether a Fund claim is eligible. The final rules provide that the ALJ makes the final decisions on eligibility. The final regulations (see §§ 296.8 (b) and (d)(1)) include a procedure for expedited review by the ALJ of claims which the Chief, FSD, and the NOAA General Counsel believe are incomplete, untimely filed, or clearly ineligible for compensation.

NOAA believes the suggested 5-day maximum limitation of the time in which these actions must be accomplished is neither practical nor necessary. No change in these final rules has been made to reflect this suggestion.

Action by the Secretary of the Interior

Section 296.8(d)(2) of the proposed regulations (§ 296.8(a)(2) in the final regulations) required the Secretary of the Interior to send a notice of each claim to all persons known to have engaged in Outer Continental Shelf oil and gas activities in the vicinity of the casualty.

Comments: The following comments were received in this section: The word "vicinity" is too vague and should be more specifically defined; and

All persons who contributed to an area account should receive notice of a claim relating to a casualty in that area account. Such persons would not, otherwise, have an opportunity to investigate casualties or object to claims for them. Lack of notice might constitute an unlawful taking and be a violation of due process.

Response: These final rules have been changed so that "vicinity" is defined as all lease blocks either wholly or partially within a 3-mile radius of the casualty. Wider notice may, however, be made if, in the judgment of the Interior Department, the casualty or the nature of OCS oil and gas operations where the casualty occurred reasonably require wider notification. NOAA does not believe it is necessary or appropriate routinely to require giving actual notice to all persons who contribute to an area account. Since notice of all claims will be published in the Federal Register with an opportunity for interested persons to submit evidence and request to participate in any hearing on the claim, due process of law will be adequately addressed.

Responses to Notice of Claims

Section 296.8(d)(3) of the proposed regulations (§ 296.8(a)(3) of the final regulations) required persons intending to submit evidence at a hearing to first notify the ALJ and the Chief, MNFS Financial Services Division, within thirty days after a notice of a claim is published in the Federal Register. This section limits the persons who may submit evidence at a hearing to those persons engaged in activities associated with Outer Continental Shelf oil and gas activities in the vicinity of a claimant's casualty.

Comment: The following comments were submitted on this section:

The thirty-day rule should be waived if [illegible] person can show why he did not [illegible] nowledge that he would be an [illegible]sted party to the claim; and

Anyone who contributes to the Fund should have standing to submit evidence at any hearing.

Response: These final rules have been changed to enable the Chief, FSD or the ALJ, at their discretion and for good cause shown, to waive the thirty-day rule and allow an "interested person" to submit evidence which might have a significant bearing upon the claim.

"Interested person" is defined in these final regulations to mean a person (including a lessee or permittee or such person's contractor or subcontractor) known to have engaged in activities assocated with OCS oil and gas exploration, development or production in the vicinity where the claimant's damage or loss occurred. This definition is derived from 43 U.S.C. section 1845(c), which provides that certain persons may submit evidence at any hearing concerning a claim.

The final rules allow any peson to send evidence to the Chief, FSD, for use in preparing a proposed settlement or other agency recommendation. The ALJ's powers will allow the ALJ to let any person present evidence as a [illegible]ess, since the ALJ will able to [illegible]it evidence.

[illegible]commended settlement.

Agency recommendation.

Objection to Recommended Settlement

Sections 296.8(e), (f) and (g) of the proposed regulations would allow the Government to file with the ALJ appointed to decide a claim either (1) a recommended settlement, if the Government and the claimant can agree that the claim can be settled without an evidentiary hearing before the ALJ, or (2) an agency recommendation, if such a settlement cannot be agreed upon. Any person disagreeing with a recommended settlement could request a hearing under 5 U.S.C. section 554.

Comment: The following comments were received on these sections:

Limit recommended settlements to claims for $5,000 or less and dispense altogether with agency recommendations; and

If a person forces a recommended settlement to an evidentiary hearing and the ALJ subsequently adopts the recommended settlement, such person should pay the cost of the hearing.

Response: Where (1) a claim appears [illegible]ible and reasonable and (2) the [illegible].mant and the Government can agree on a recommended settlement amount, the cost savings to the Fund of avoiding an evidentiary hearing will be considerable. NOAA does not believe a dollar ceiling on the amount of a recommended settlement is necessary or appropriate.

Although the Government may not always file an agency recommendation where the claimant and the Government cannot agree on a recommended settlement, the Government will do so when, in its judgment, the claim may in any respect be unreasonable or ineligible. NOAA believes that the Government, with the Fund's interest in mind, has a duty to advise the ALJ in such instances.

Whether or not a request for an oral hearing on a recommended settlement is granted depends, generally, upon the ALJ's judgment whether the hearing would aid in fairly adjudicating the claim. If, in the ALJ's judgement, a hearing would be an aid, the person making the request should not be held liable for the cost of the hearing. Under the final regulations, any interested person objecting to a proposed settlement may request the ALJ to conduct an oral hearing concerning the claim. Such requests are filed with the NOAA General Counsel, who sends them to the ALJ along with the claim.

No change in these final rules has been made in response to these comments. (See §§ 296.8 (b), (c), (d), (e), and (f) of these final regulations).

H. Section 296.9. Burden of Proof and Presumptions

Presumption

Section 296.9(b) deals with the factors required for a presumption of claim validity. A claim is presumed to be caused by OCS oil and gas activities if the claimant establishes that: (1) The commercial fishing vessel was being used for fishing in an area affected by Outer Continental Shelf oil and gas activities, (2) the location of the obstruction and the nature of the casualty was reported within five days of its occurrence, (3) the obstruction was not marked on nautical charts or published in a Notice to Mariners, and (4) there was no surface marker or lighted buoy. If the criteria are fulfilled, a claimant need not establish the nature of the obstruction.

Comments: Comments submitted on this section included the following:

The section should be changed to require a claimant to establish that an obstruction was (1) man-made and (2) resulted from oil and gas activities. The section, as proposed, is a severe extension beyond statutory authority. Each presumably valid claim should be subjected to on-site investigation by the Government. If at least five survey passes with magnetometer and side-scan sonar revealed no obstruction, the presumption of validity should be rebutted;

The presumption of causation should be overcome by subsequent evidence, including that required to be submitted in claims;

Only obstructions appearing in the Notice to Mariners current on the date of the casualty should operate to deny the presumption;

Pipelines should be specifically excluded as charted or noted obstructions which can operate to deny the presumption; and

One commenter stated the Notice to Mariners issued by the Defense Mapping Agency is not a proper means of notifying fishermen of obstructions, since Defense Mapping Agency publications are neither intended for fishermen nor read by them.

Response: In these final rules, the presumption is called a presumption of "causation," not of "validity." The presumption of causation is provided for in the Fund's authorizing legislation. Although the presumption may sometimes result in the payment of claims that might not in fact be eligible, its absence would sometimes result in the nonpayment of claims that in fact are eligible. Since fishing gear is often damaged by underwater obstructions which can neither be retrieved nor identified by fishermen, nor located and identified by the Government, Congress decided to presume that such obstructions were related to oil and gas activities when they occurred in areas affected by oil and gas activities. The basic presumption has, consequently, been retained in these final rules.

Two other changes in these final rules, should, however, result in a more reasonable restriction of the presumption's availability. First, the term "area affected by Outer Continental Shelf oil and gas exploration, development, or production activities" has been more specifically defined so as to limit availability of the presumption to specific geographic areas where it is reasonably likely that obstructions resulted from OCS oil and gas activities. Second, § 296.9(c) has been added, to deny the presumption for any casualty occurring within a one-quarter mile radius of any obstruction which had been marked on National Ocean Survey nautical charts, listed in Notices to Mariners, or marked by a buoy or other surface marker.

NOAA believes fishermen should avoid all obstructions which have been

properly marked on current nautical charts, noted in current or past Notices to Mariners or marked by a buoy. Fishermen who encounter an obstruction within one-quarter mile of such known obstructions may regain the presumption of causation by showing that the obstruction involved in the casualty is different than the previously known obstruction. Note also that failure to qualify for the presumption of causation does not bar a claim, but the fisherman would have to prove that the obstruction causing the damage was OCS oil or gas related.

Greater certainty about the identity of an object could be obtained if, as the comments suggested, the Government made investigations at the site of each casualty. The Government does not presently have the means of doing so, but nothing prevents other persons from doing so and submitting the results as evidence in the disposition of a claim.

NOAA believes that the presumption of causation is available only if the preponderance of the evidence favors the presumption. We do not think it necessary to specify in the final rules that contrary evidence may rebut the presumption.

Pipelines are expected to be installed in such a way as not to pose a hazard to commercial fishing. The ownership of pipelines is generally known and the owners are generally "financially responsible parties." This will make most casualties caused by pipelines ineligible for Fund compensation under the provisions of the Fund's authorizing legislation which excludes Fund compensation for casualties caused by obstructions attributable to "financially responsible parties." In addition, the new restriction on the geographic availability of the presumption of causation will operate to reduce claims due to pipelines or obstructions near them which are charted, on Notices to Mariners, or marked by a buoy.

There are two types of Notices to Mariners: Local notices issued by the U.S. Coast Guard for each Coast Guard District; and a weekly notice issued by the Defense Mapping Agency, Hydrographic/Topographic Center, for the entire offshore State waters and Outer Continental Shelf surrounding the United States. Both notices primarily give notice of hazards to surface navigation and neither are designed to give notice of bottom hazards to commercial fishing. The notice issued by the Defense Mapping Agency was selected as the primary vehicle for the statutory notification of obstructions posing bottom hazards to commerical fishing because it covers the entire range of marine State waters and the Outer Continental Shelf surrounding the United States. The local notices issued by the U.S. Coast Guard, on the other hand, cover only the Coast Guard District where the notice is issued and relate primarily to coastal and near-shore areas. Since fishermen often fish in more than one Coast Guard District, they would have to read more than one Coast Guard notice to be informed about obstructions in the total area in which they might fish. Since fishermen often fish both within and outside the ocean area covered by the Coast Guard notices, they would have to read both the Coast Guard notices and the Defense Mapping Agency notices to be informed about obstructions in the total ocean area in which they fish. Exclusive usage of the Defense Mapping Agency notice would remove these problems since all fishermen in all areas would need to read only one weekly notice to be informed about all obstructions in all areas. This would also be a more efficient use of Government resources since the extra distribution of notices occasioned by the Fund would be confined to one weekly notice. Accordingly, these final rules have been changed to make the weekly Notice to Mariners issued by the Defense Mapping Agency the exclusive standard for determining whether official notification of Outer Continental Shelf obstructions has been given in a Notice to Mariners. NMFS will be reporting the location of claimed obstructions to the National Ocean Survey, which sends the information to the Defense Mapping Agency for inclusion in the Notice to Mariners.

I. Section 296.10. Hearings. [Reserved]

NOAA is temporarily reserving publication of final regulations governing the process for adjudicating claims. We expect that the final regulations will encourage resolution of claims without costly and time-consuming oral hearings. We believe the ALJ should have adequate powers to expedite the proceedings, for example by requiring all evidence to be submitted in written or documentary form. We also believe the ALJ should have some control over the degree of participation allowed for affected, or potentially affected, members of the OCS oil and gas industry and other persons. Reserving this section should not hinder the process of funding the area accounts or the processing of claims by NMFS to prepare them for referral to the ALJ. We expect that issuance of § 296.10 at a future date will result in few, if any, changes to the other regulations in this Part 296.

Section 296.11 Payment of Costs

This section describes circumstances under which either claimants or oil and gas entities denying responsibility for claimants' damages may be required to pay hearing costs.

Comment: The following comments were submitted concerning this section:

The Fund's authorizing legislation does not authorize an ALJ to find any person liable for the casualty, thus liable for payment of hearing costs;

The ALJ has no jurisdiction over oil and gas entities and, therefore, may not assess hearing costs against oil and gas entities until a court of law has found such entities responsible; and

If both claimants and oil and gas entities denying responsibility are found to have joint responsibility for the damage or loss incurred, then hearing costs should be apportioned between them.

Response:

NOAA believes that the Title IV statute authorizes the ALJ to make the finding of responsibility.

The final rules have been changed to provide that when both claimants and oil and gas entities denying responsibility are found to have joint responsibility for the damage or loss incurred, hearing costs will be apportioned equitably between them.

K. Section 296.14. *Subrogation.*

This section requires claimants to sign subrogation agreements before receiving compensation from the Fund and subsequently to assist the Government in any reasonable way to pursue the subrogated rights.

Comment:

One commenter stated the word "reasonable" should be specifically defined so as to guard against claimants' spending undue amounts of time or money.

Response:

The variety of possibilities precludes specifically defining the word "reasonable", but every attempt possible will be made to minimize claimants' time and expense in assisting the Government to pursue subrogated rights.

L. *General.*

Several general comments were received in response to the proposed rulemaking. These comments and the NMFS responses follow.

Comment:

One commenter suggested including a provision for a Government advocate to represent the Fund.

Response:

We believe the statutory provision for adjudication by the ALJ indicates Congressional intent to provide an impartial forum for the weighing of all available evidence. The Government will, however, analyze claims and, where appropriate, forward either a proposed settlement or agency recommendation to the ALJ. These final regulations provide for review of NMFS recommendations on claims by the NOAA Office of General Counsel, to assure that proposed settlements or other agency recommendations forwarded to the ALJ fairly consider the interests of the Fund. Generally, the Office of the General Counsel, rather than the Chief, Financial Services Division, will be responsible for the Government's handling of the claim from the time it is ready to be submitted to an ALJ until the time an ALJ issues a decision.

Comment:

One commenter stated that lack of diligence in locating the obstruction involved in a casualty, and marking it by buoy if possible, should have a bearing on the claim's outcome and could reflect negligence.

Response:

The Fund's authorizing legislation established no duty for claimants to mark obstructions by the placement of buoys. To do so would often be impractical because it would require all fishermen to sail with an assortment of buoys and anchoring components sufficient to provide for buoy placement under different ocean conditions. All fishermen will be expected to accurately fix the position of obstructions causing them damage. No change in these final rules is warranted.

II. *Other Changes.*

NOAA has made numerous other changes in various sections of the final rules. These changes and the reasons for them are listed below.

A. Throughout the regulations, the term "hearing examiner" has been changed to "administrative law judge" or "ALJ", to reflect current usage in 5 U.S.C. section 3105.

B. Paragraph (e)(7) of § 296.7 has been changed in these final rules to require claims to be more specific about the nature of the fishing operation being conducted at the time of the casualty.

C. Proposed § 296.8(d)(1)(iii)(C) has been deleted from these final rules. This paragraph would have required the name and address of the hearing examiner to have been included in the Federal Register notice of claim published by the Chief, Financial Services Division, National Marine Fisheries Service. This deletion has been made because the name and address of the hearing examiner may be unknown at the time this notice is required to be published (see § 296.8(a)(1)(iii)). Requests to submit evidence at a hearing will be made to the Chief, FSD, who will include the request in the case file for action by the ALJ.

D. Proposed § 296.8(d)(3)(iv) has been modified in these final rules (see § 296.8(a)(3)(iv)). An admission of responsibility for the casualty removes it from the possibility of Fund compensation, regardless of whether or not the claimant and the person admitting responsibility are able to settle the matter. However, if such a person later denies responsibility, the casualty should again become eligible for Fund compensation.

Note.—The Assistant Administrator for Fisheries made an initial determination that these regulations are not significant under Executive Order 12044. The Assistant Administrator has also determined that these regulations do not require the preparation of an environmental impact statement under the National Environmental Policy Act.

The Assistant Administrator for Fisheries, NOAA, finds that there is good cause to make certain sections of these regulations effective immediately, in order to formalize procedures for receiving claims, and to allow processing of claims that already have been received. Sections effective on January 24, 1980, are §§ 296.1 through 296.3, §§ 296.5 through 296.9, and § 296.15. Section 296.4 and §§ 296.11 through 296.14 will become effective February 25, 1980. Any lease, exploration permit, easement or right-of-way in effect on January 24, 1980, shall be assessed under § 296.4(a) and (c)(1). Section 296.10 is reserved.

January 21, 1980.

Winfred H. Meibohm,

Executive Director, NMFS.

(92 Stat. 629, Pub. L. 95–372, (43 U.S.C. 1841 *et seq.*))

Accordingly, 50 CFR Part 296 is promulgated, as follows:

PART 296—FISHERMEN'S CONTINGENCY FUND

Sec.

296.1 Purpose.
296.2 Definitions.
296.3 Fishermen's Contingency Fund.
296.4 Payments into the Fund.
296.5 Claims Eligible for Compensation.
296.6 Amounts of Awards.
296.7 Instructions for Filing Claims.
296.8 NMFS Processing of Claims.
296.9 Burden of Proof and Presumption of Causation.
296.10 Hearings. [Reserved]
296.11 Payment of Costs.
296.12 Appeals.
296.13 Payment of Award for Claim.
296.14 Subrogation.
296.15 Computation of Time.

Authority: Pub. L. 95–372; 92 Stat. 629 (43 U.S.C. 1841 *et seq.*)

§ 296.1 Purpose.

These regulations implement Title IV of the Outer Continental Shelf Lands Act Amendments of 1978 ("Title IV"). Title IV establishes a Fishermen's Contingency Fund to compensate commercial fishermen for eligible claims for actual and consequential damages, including loss of profits, due to damage to, or loss of, fishing gear by materials, equipment, tools, containers, or other items associated with oil and gas exploration, development, or production activities on the Outer Continental Shelf.

§ 296.2 Definitions.

Unless the context otherwise requires, the terms used in this Part have the following meanings:

"ALJ" means an administrative law judge or hearing examiner appointed under 5 U.S.C. section 3105.

"Area account" means an account, within the Fishermen's Contingency Fund, for a specific area of the Outer Continental Shelf, as described in § 296.3.

"Area affected by OCS oil and gas exploration, development, or production activities" means any geographic area which is:

(1) Under oil or gas lease on the OCS;

(2) Within one-half geographical mile of an oil or gas lease, pipeline, easement, or right-of-way which is on the OCS; or

(3) Otherwise associated with OCS oil and gas activities (such as expired lease areas, relinquished rights-of-way and easements, and areas used extensively by surface vessels supporting OCS oil and gas activities).

Determinations about areas which are "otherwise associated with OCS oil and gas activities" under paragraph (3) of this definition will be made on a case-by-case basis by the Chief, FSD, based upon information supplied by the Secretary of the Interior; such determinations are subject to review by the ALJ when the ALJ adjudicates the claim.

Areas landward of the Outer Continental Shelf are included under this definition when such areas meet the criteria of this definition.

"Chief, Financial Services Division, NMFS" or "Chief, FSD" means the Chief

of the Financial Services Division, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, 3300 Whitehaven St., N.W., Washington, D.C., 20235.

"Citizen of the United States" means (1) any person who is a United States citizen by law, birth, or naturalization; (2) any State, any agency of a State, or a group of States; (3) any partnership or association organized under the laws of any State; or (4) any corporation organized under the laws of any State which has as its president or other chief executive officer and as its chairman of the board of directors, or holder of a similar office, a person who is a United States citizen by law, birth, or naturalization, and which has at least seventy-five percent (75%) of the interest in the corporation owned by citizens of the United States. Seventy-five percent (75%) of the interest in the corporation shall not be deemed to be owned by citizens of the United States if:

(a) The title of seventy-five percent (75%) of its stock is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States;

(b) Seventy-five percent (75%) of the voting power in such corporation is not vested in citizens of the United States;

(c) Through any contract or understanding it is so arranged that more than twenty-five percent (25%) of the voting power may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or

(d) By any other means whatsoever, control of any interest in the corporation in excess of twenty-five percent (25%) is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

"Claimant" means a commercial fisherman who files a claim under this Part.

"Commercial fisherman" means any citizen of the United States who owns, operates, or derives income from being employed on a commercial fishing vessel.

"Commercial fishing vessel" means any vessel, boat, ship, or other craft which is (1) documented under the laws of the United States or, if under five net tons, registered under the laws of any State, and (2) used for, equipped to be used for, or of a type which is normally used for commercial purposes for the catching, taking, or harvesting of fish or the aiding or assisting at sea of any activity related to the catching, taking, or harvesting of fish, including, but not limited to, preparation, supply, storage, refrigeration, transportation, or processing.

"Easement" means a right of use of easement granted under 30 CFR 250.18.

"Exploration permit" means the "permit" defined in 30 CFR Part 251.

"Financially responsible party" means a financially solvent person who is responsible for damage to or loss of a commercial fishing vessel or fishing gear by materials, equipment, tools, containers or other items associated with OCS oil and gas exploration, development, or production activities.

"Fish" means finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals, birds, and highly migratory species.

"Fishing gear" means (1) any commercial fishing vessel, and (2) any equipment of such vessel, whether or not such equipment is attached to the vessel.

"Fund" means the Fishermen's Contingency Fund established under 43 U.S.C section 1842.

"General Counsel" means the General Counsel, National Oceanic and Atmospheric Administration, or a designee.

"Holder" means the record owner of each lease, exploration permit, easement, or right-of-way or any agent or assignee of such record owner.

"Interested person" means a person (including a lessee or permittee or such person's contractor or subcontractor) known to have engaged in activities associated with OCS oil and gas exploration, development or production in the vicinity where the claimant's damage or loss occurred.

"Lease" means any form of authorization issued under section 8 or maintained under section 6 of the Outer Continental Shelf Lands Act and which authorizes exploration for, and development and production of, oil and gas resources.

"Natural obstruction" means any object or thing not made or caused by humans which hinders or prevents the operation of fishing gear.

"NMFS" means the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce.

"National Ocean Survey" means the National Ocean Survey, National Oceanic and Atmospheric Administration, Department of Commerce.

"Outer Continental Shelf" or "OCS" means all submerged lands lying seaward and outside of the area of lands beneath navigable waters as defined in 43 U.S.C. section 1301, and of which the subsoil and seabed appertain to the United States and are subject to its jurisdiction and control.

"Outer Continental Shelf Lands Act" means 43 U.S.C. section 1331 *et seq.*, as amended.

"Person" means an individual, partnership, corporation, association, public or private organization, government, or other entity.

"Right-of-way" means a right-of-way granted under section 5(e) of the Outer Continental Shelf Lands Act (43 U.S.C. section 1334(e)) or under 43 CFR 3340.0-5.

"Secretary of the Interior" means the Secretary of the Department of the Interior or a designee.

"Title IV" means Title IV of the Outer Continental Shelf Lands Act Amendments of 1978, 92 Stat. 629, Pub. L. 95-372, 43 U.S.C. section 1841 *et seq.*

"USGS" means the United States Geological Survey, Department of the Interior.

§ 296.3 Fishermen's Contingency Fund.

(a) *General.* There is established in the Treasury of the United States a Fishermen's Contingency Fund consisting of the area accounts designated in paragraph (b) of this section.

(b) *Area accounts.* The following area accounts are established within the Fund:

(1) *North Atlantic Area Account.* This account is for the area of the OCS in the Atlantic Ocean which is bounded by the U.S.-Canadian boundary on the north, 39° N. latitude on the south, and 71° W. longitude on the west.

(2) *Mid-South Atlantic Area Account.* This account is for those areas of the OCS in the Atlantic Ocean which are:

(i) Both north of 39° N. latitude and west of 71° W. longitude;

(ii) South of 39° N. latitude and east of 80°15′ W. longitude (off the southern coast of Florida); or

(iii) Adjacent to any U.S. territory, commonwealth, or possession in the Atlantic Ocean or the Caribbean Sea to which the Outer Continental Shelf Lands Act applies.

(3) *Pacific Area Account.* This account is for the area of the OCS adjacent to Washington, Oregon, California, Hawaii, or any U.S. territory, commonwealth, or possession in the Pacific Ocean to which the Outer Continental Shelf Lands Act applies.

(4) *Alaska Area Account.* This account is for the area of the OCS adjacent to Alaska.

(5) *Freeport Area Account.* This account is for the area of the OCS in the Gulf of Mexico as described in section A of Appendix I of this part. This area is identical to the USGS Freeport District.

(6) *Lake Charles Area Account.* This account is for the area of the OCS in the ılf of Mexico as described in section B ppendix I of this part. This area is ntical to the USGS Lake Charles District.

(7) *Lafayette Area Account.* This account is for the area of the OCS in the Gulf of Mexico as described in section C of Appendix I of this part. This area is identical to the USGS Lafayette District.

(8) *Houma Area Account.* This account is for the area of the OCS in the Gulf of Mexico as described in section D of Appendix I of this part. This area is identical to the USGS Houma District.

(9) *Metairie Area Account.* This account is for the area of the OCS in the Gulf of Mexico as described in section E of Appendix I of this Part. This area is identical to the USGS Metairie District.

(c) *Exclusion.* The geographic area for each area account described in paragraph (b) of this section does not include submerged lands recognized by the United States as being under the jurisdiction of any State under the Submerged Lands Act (43 U.S.C. section 1301 *et seq.*).

(d) *Amounts.* Each area account shall be funded initially at $100,000. Amounts in any area account may not exceed $100,000.

⁵ 296.4 Payments into the Fund.

ı) *Initial assessments.* Each lease ıed or maintained under the Outer Continental Shelf Lands Act for any tract in any geographical area for which there is an area account, each easement or right-of-way for the construction of a pipeline in such area, and each exploration permit in such area, in effect at any time on or after January 24, 1980 shall be assessed in accordance with paragraph (c) of this section so that $100,000 will be collected in each area account.

(b) *Assessments to maintain accounts.*—(1) *When depleted.* If the total amount in any area account is less than $50,000, the Chief, FSD, may determine that the account is depleted. After making the determination, the Chief, FSD, will notify the Secretary of the Interior that an assessment is needed to maintain the area account.

(2) *Amounts.* Each lease, permit, easement, and right-of-way which is both (i) in the geographical area for which there is a depleted area account (as determined under paragraph (b)(1) of this section) and (ii) in effect on the date an assessment is effective, shall be assessed such amount as is necessary to ıcrease the total amount in the area ·ount to $100,000.

c) *Calculation of amount.*—(1) *Criteria.* The amount to be paid under paragraphs (a) and (b) of this section by each holder of a lease, exploration permit, easement, and right-of-way in any geographical area for which there is an area account shall be determined as follows:

(i) Each exploration permit in effect on the date an assessment is effective is assessed $50.00.

(ii) Leases, easements, and rights-of-way are assessed equally on a per-unit basis based on the number of leases and pipeline segments in effect on the date an assessment is effective.

(iii) New permits, leases, rights-of-way, and easements, that come into existence after an assessment is made, escape assessment until the next assessment, at which time all permits, leases, rights-of-way, and easements in effect are assessed.

(iv) Pipeline rights-of-way and easements in the Gulf of Mexico are credited to the area account in which the pipeline segment originates.

(v) Pipeline easements to be assessed do not include flow or gathering lines within the confines of a single lease or group of contiguous leases under unitized operation or a single operator.

(2) *By whom calculated.* The Secretary of the Interior will calculate the amounts to be paid by each holder.

(d) *Billing.*

(1) The Chief, FSD, will inform the Secretary of the Interior each time there is to be an assessment under this section.

(2) The Secretary of the Interior will notify each appropriate holder of the assessments and in what amount and where payable. Such notification shall include an itemized statement of the assessment.

(e) *To whom, by whom and when payable.* Each assessment under this section shall be paid to the Secretary of the Interior by the holder no later than 30 days after the Secretary of the Interior sends notice of the assessment under paragraph (d)(2) of this section.

(f) *Maximum payment.* No lease, exploration permit, easement, or right-of-way shall be assessed more than a total of $5,000 in any calendar year under this section.

§ 296.5 Claims eligible for compensation.

(a) *Claimants.* To be eligible for compensation under this Part, the damage or loss must be suffered by a commerical fisherman.

(b) *Damage or loss of fishing gear.* Except as provided in paragraph (c) of this section, any actual or consequential damage (including loss of profits) due to damage to or loss of fishing gear caused by materials, equipment, tools, containers, or other items associated with oil and gas exploration, development, or production activities in a geographical area for which an area account has been established under § 296.3 is eligible for compensation under this part. Damage or loss may be eligible for compensation even if it did not occur in the waters above the OCS, if the item causing the damage or loss was associated with OCS oil and gas exploration, development, or production activities.

(c) *Exceptions.* As specified by the Title IV statute, damage or loss is not eligible for compensation under this part:

(1) If the damage or loss with respect to which the claim is filed was caused by materials, equipment, tools, containers, or other items attributable to a financially responsible party;

(2) To the extent that damages were caused by the negligence or fault of the commercial fisherman making the claim (see also § 296.6(e));

(3) If the event causing the damage or loss with respect to which the claim is filed occurred before September 18, 1978;

(4) In the case of a claim for damage to, or loss of, fishing gear, in an amount in excess of the replacement value of the fishing gear with respect to which the claim is filed;

(5) In the case of a claim for loss of profits (i) for any period in excess of 6 months, and (ii) unless such claim is supported by records with respect to the claimant's profits during the previous 12-month period (see also §§ 296.6(c)(2) and 296.7(e)(11));

(6) For any portion of the damages claimed with respect to which the claimant has or will receive compensation from insurance (see also § 296.6(f));

(7) If the claim is not filed within 60 days after the date the claimant discovers the damage or loss with respect to which the claim is filed (see also §§ 296.7(c) and 296.8(b)); and

(8) If the damage or loss was caused by a natural obstruction or an obstruction unrelated to OCS oil and gas exploration, development, or production activities.

§ 296.6 Amount of awards.

(a) *General.* The amount of the award under this part is the total of the amounts under paragraphs (b), (c) and (d) of this section, minus any reductions under paragraphs (e) and (f) of this section and minus any reduction under § 296.11 (if applicable).

(b) *Fishing gear.* If the fishing gear with respect to which the claim is filed can be repaired to a condition substantially similar to its condition

immediately before the damage was suffered, at a cost less than its replacement cost minus its salvage value, then the amount of compensation is its repair cost. In all other cases (including loss of the fishing gear), the amount of compensation is the lost or damaged gear's replacement cost minus its salvage value. For the purposes of this § 296.6, the term "replacement cost" means the cost of supplying new fishing gear of the same or substantially similar size, type, and materials, without reference to the age or condition of the gear damaged or lost.

(c) *Consequential damage.*—(1) *Expenses.* The amount of an award under this Part will include compensation for any reasonable expenses actually incurred by the claimant to ascertain the cause and extent of the damage or loss caused to fishing gear and to obtain a decision in the claimant's favor. The ALJ will determine what expenses are reasonable and their amounts.

(2) *Loss of profits.* (i) The amount of an award under this Part will include compensation for any loss of profits due to damage to, or loss of, fishing gear with respect to which the claim is filed.

(ii) A claim for loss of profits due to loss of time spent in disengaging fishing gear from any item described in § 296.5(b) may be eligible for compensation under this part even if the fishing gear involved was not damaged or lost. Compensation for this type of lost profits ordinarily will not exceed what would have been the replacement cost, less salvage value, of the fishing gear disengaged, unless the claimant can show that his efforts to disengage the gear were of reasonable duration and that abandonment of the gear would have resulted in a greater economic loss.

(iii) No award may be made under this Part for loss of profits for any period in excess of 6 months from the date when the damage or loss of the fishing gear was discovered.

(iv) A claim for loss of profits must be supported by records with respect to the claimant's profits during the 12-month period immediately preceding the date of the discovery of the damage to or loss of the fishing gear (if the claimant was not a commercial fisherman for all of the 12-month period or if the fishery involved is a new one, estimates of profit may be based on NMFS statistics or other reliable evidence);

(v) In determining the amount awarded under this paragraph (c)(2), the ALJ may consider any evidence concerning:

(A) Profits from the corresponding quarter of the previous year;

(B) Profits from trips immediately before and after the loss or damage which is the subject of the claim;

(C) Such other evidence as the claimant may submit; and

(D) Such other evidence as the hearing examiner may deem appropriate.

(vi) The measure of compensation for loss of profit ordinarily is the net profit lost. If the ALJ determines that a different measure of compensation for loss of profit is appropriate because the facts of the claim are sufficiently extraordinary, and states the reasons for the determination, the ALJ may apply the measure of compensation which the ALJ deems to be most appropriate.

(vii) In making either an agency recommendation or a proposed settlement under § 296.8(c), the Chief, FSD, will use an administrative standard to determine lost profit. The administrative standard will be based on the latest Federal income tax return which best establishes the annual income and expenses of the vessel involved in the loss or damage (or in the discretion of the Chief, FSD, a similar vessel). The annual net profit in such a return will be used to compute the vessel owner or operator's loss of net profit for a reasonable period during which vessel operation was precluded by the damage or loss with respect to which the claim is filed. With respect to claims filed by crew members, the annual income and expense data in such a return will be used to compute the crew member's share according to the contractual share to which each crew member was entitled. The Chief, FSD, ordinarily will not attempt to settle a claim for loss of profits if the Federal income tax return pertaining to the vessel involved (or a similar vessel) is not made available. In such cases, the compensation for lost profits will be determined by the ALJ.

(3) *Other.* An award under this part may include compensation for any other consequential damage resulting from the damage or loss of fishing gear, but may not include compensation for personal injury resulting from damaged fishing gear.

(d) *Attorneys' fees.* An award under this part will include compensation for reasonable attorneys' fees incurred by the claimant in obtaining a decision in the claimant's favor. Claimants will not be compensated for attorneys' fees if the claim is denied.

(e) *Negligence of claimant.* (1) The amount of an award under this part is reduced to the extent that the ALJ finds that the loss or damage (including consequential damages) was caused by the negligence or fault of the claimant. (For example, a claimant who sustained $10,000 in damages and whose negligence or fault was found to be responsible for 40% of the damage would receive $6,000 in compensation. If the same claimant were responsible for 99% of the negligence or fault that caused the damage, the claimant would receive $100 in compensation).

(2) Negligence or fault of the claimant includes, but is not limited to, failure to:

(i) Remain outside of any navigation safety zone established around oil and gas rigs and platforms by any responsible Federal agency;

(ii) Avoid obstructions recorded on nautical charts or in the Notice to Mariners, or marked by a buoy or other surface marker (casualties occurring within a one-quarter mile radius of obstructions so recorded or marked are presumed to involve negligence or fault of the claimant);

(iii) Abide by established rules of the road;

(iv) Use proper care; or

(v) Attempt to mitigate, or to use due care and diligence mitigating the damage to, or loss of, the fishing gear and any resulting economic loss.

(3) With respect to the actions described in paragraph (e)(2) of this section, negligence of the owner or operator of the commercial fishing vessel involved in a claim shall bar or reduce an award to the vessel's crew members with a claim arising from the same damage or loss to the same extent that it bars or reduces an award to such owner or operator.

(f) *Insurance proceeds.* (1) The amount of any award under this part will be reduced by the amount of any compensation the claimant received, or will receive, from insurance for the damage or loss with respect to which the claim against the Fund is filed.

(2) If the claimant has insurance which covers the damage, or any portion of it, the claimant must seek compensation from the insurance. No award will be made from the Fund for damage which is covered by the claimant's insurance.

§ 296.7 Instructions for filing claims.

Five-Day Report

(a) *Five-day report required to gain presumption of causation.*—(1) *General.* Under § 296.9(b) damages or losses are presumed to be caused by items associated with OCS oil and gas exploration, development, or production activities if certain requirements are satisfied. One requirement is that a report on the location of the obstruction which caused the damage or loss, the nature of the damage or loss, and certain other information specified in

paragraph (a)(4) of this section, *must be made to the NMFS within five (5) days after the date when the damage or loss is discovered.* If more than one commercial fisherman suffers loss from same incident, the owner or operator of the commercial fishing vessel involved may file a five-day report on behalf of the entire crew, owner, and operator of the vessel. Note that filing of a five-day report must be followed up by filing of a detailed claim under paragraphs (b), (c), (d), and (e) of this section.

(2) *When and how to file a five-day report.* To qualify for the presumption of causation, a five-day report must be made to the nearest NMFS Regional Office within 5 days after the date the claimant discovered the loss or damage. Satisfaction of the five-day requirement is determined by the date of postmark, if the report is mailed; by the date of receipt of a call, if the report is telephoned or radio-telephoned; or, by the date of appearance, if the report is made in person at the nearest NMFS Regional Office. NMFS addresses and telephone numbers to use for making a five-day report are listed below:

Chief, Financial Services Branch, Northeast Region, National Marine Fisheries Service, Post Office Building, Box 1109, Gloucester, Massachusetts 01930 (617) 281–3600

Chief, Fisheries Development Analysis Branch, Southeast Region, National Marine Fisheries Service, 9450 Koger Boulevard, Duval Building, St. Petersburg, Florida 33702 (813) 893–3271

Chief, Fisheries Development Division, Southwest Region, National Marine Fisheries Service, 300 South Ferry Street, Terminal Island, California 90731 (213) 548–2575

Chief, Financial Services Branch, Northwest Region, National Marine Fisheries Service, 1700 Westlake Avenue North, Seattle, Washington 98109 (206) 442–5532

Chief, Fisheries Development, Alaska Region, National Marine Fisheries Service, P.O. Box 1668, Juneau, Alaska 99802 (907) 586–7224

(3) *Written confirmation of oral five-day report.* The Chief, FSD, strongly recommends that claimants confirm, in writing, as soon as possible, the substance and accuracy of each five-day report that is made by telephone, radiotelephone or other oral communication. Address the written confirmation to:

Chief, Financial Services Division, National Marine Fisheries Service, 3300 Whitehaven St., N.W., Washington, D.C. 20235.

(4) *Contents of five-day report.* Each five-day report must include the following information:

(i) The claimant's name and address;

(ii) The name and identifying number of the commercial fishing vessel involved;

(iii) The location of the obstruction which caused the damage or loss (see paragraph (e)(27) of this section for the methods of position fixing);

(iv) A statement concerning the activities, at the time the damage or loss occurred, of the vessel involved;

(v) A description of the nature of the damage or loss;

(vi) The date such damage or loss was discovered;

(vii) A description of the obstruction, if known; and

(viii) A statement concerning whether or not a surface marker or lighted buoy was attached to or near the obstruction.

Detailed Claim Form

(b) *Form of claim.* Claims must be in writing and include the information specified in paragraphs (e)(1) through (29) of this section. When available, claim forms may be obtained from any NMFS Regional Office or from the Chief, FSD.

(c) *Who must file, and when and where to file claims. Each claimant must file a claim (even those who filed five-day reports to gain the presumption of causation).* Each claim must be filed, in writing, with the Chief, Financial Services Division, National Marine Fisheries Service, 3300 Whitehaven St. N.W., Washington, D.C. 20235, *no later then 60 days after the date the claimant discovers the damage or loss* with respect to which the claim is made. For the purpose of this paragraph (c), the term "filed" means delivered in person, or mailed (as determined by the date of postmark), to the Chief, FSD. The Chief, FSD, suggests that a claim which is mailed be sent by registered or certified mail, return receipt requested, so the claimant will have a record that the claim was received by the Chief, FSD.

(d) *Aggregating claims.* If more than one commercial fisherman suffers loss or damage arising from the same incident (for example, when several members of the crew lost income due to loss of fishing time), the claims of all such fishermen should be aggregated into one claim and the claim should be submitted on their behalf by the owner or operator of the commercial fishing vessel or vessels involved.

(e) *Contents.* Each claim shall be signed by the claimant and shall accurately and completely provide the following information:

General Identification

(1) The name, mailing address, telephone number, citizenship, and occupational status (for example, vessel owner, operator, or crew member on a vessel) of each claimant;

(2) The name, address, and telephone number of each person (for example, an attorney) retained to act on behalf of any claimant in pursuing the claim;

(3) The name of the commercial fishing vessel involved in the damage or loss for which the claim is submitted;

(4) The vessel's U.S. Coast Guard documentation number (or State registration number, if the vessel is not documented under Federal law);

(5) The home port of the vessel;

(6) The date when the claim is written;

Type and Extent of Damage or Loss

(7) A statement of: The type of fishing operation being conducted (for example, trawling for shrimp), the type and size of vessel involved, a full description of the fishing gear involved (including a list of all components);

(8) The nature and extent of the damage or loss suffered or expected;

(9) Photographs (when available) of any physical damage to fishing gear (including a commercial fishing vessel);

(10) The amount, if any, claimed for physical damage to, or loss of, fishing gear. If an amount is claimed, the claim shall include:

(i) Proof that the claimant owns the fishing gear damaged or lost (submit copies of the best evidence of ownership available, for example, sales receipts, affidavits, or other evidence);

(ii) A list of all components of fishing gear damaged or lost, together with the size, type, grade, material of construction, age, and the estimated remaining useful economic life of each component damaged or lost;

(iii) The date, place, and cost of acquisition of all fishing gear damaged or lost;

(iv) Estimates, from two different commercial fishing gear repair or supply companies, of the present replacement cost of the fishing gear and the repair cost of the fishing gear (if it is repairable). If fishing gear of the type lost or damaged is usually made or repaired by the claimant, a detailed estimate prepared by the claimant identifying the repair or replacement cost of the fishing gear may be included in place of one of the estimates from commercial fishing gear repair or supply companies;

(v) If the fishing gear is repaired or replaced before an award is made under this part, a copy of the invoice or receipt for the repair or replacement of the fishing gear; and

(vi) The estimated salvage value of the fishing gear, if it is not repairable;

(11) The amount, if any, claimed for loss of profits. If an amount is claimed,

the claim shall include copies of all records, including catch logs and landing receipts documenting the claimant's profits during the 12-month period immediately preceding the date when the damage or loss of the fishing gear was discovered. The claimant shall also include the latest Federal income tax return or other suitable evidence for the operational income of the vessel involved in the loss or damage for which the claim is submitted (or, in the discretion of the Chief, FSD, a similar vessel). (One use of the Federal tax return is described in § 296.6(c)(2)(vii).) If the claim involves a claim for a crew member's lost share of profits, include a full statement of the contractual arrangements governing determination of the shares of vessel income to which each crew member is entitled (including a copy of the contract if in writing). The claimant shall describe fully the basis upon which the amount claimed is calculated. The claimant should include whatever additional data might support, or be pertinent to, the amount claimed (for example, the duration of an average fishing trip, and the duration of the average time in port between fishing trips). Each claim shall contain a full statement of why the length of time claimed for loss of profits is justified and what action, if any, the claimant took to mitigate the amount of lost fishing time;

(12) The amount, if any, claimed for consequential damages under § 296.6(c)(1) and (3), together with a full description of what each amount claimed represents;

(13) Copies of all insurance policies covering the vessel (unless the loss or damage is to the vessel's fishing gear rather than the vessel itself) and a statement whether a claim has been, or will be, made against any insurance policy which may cover the damage or loss with respect to which the claim against the Fund is filed;

(14) The name and mailing address of each person, if any, to whom the claimant has given oral or written notice that such person caused, or may have caused, the damage or loss; together with a copy of any written notice given each person and a statement whether each such person has paid, or will pay, the claimant for any portion of the damage or loss;

Circumstances of the Damage or Loss

(15) The date and time of day, if known, when the damage or loss occurred;

(16) The date when the damage was first discovered by the claimant;

(17) The depth of the water, if known, at the time and site where the damage or loss occurred;

(18) The visibility at the time and site the damage or loss occurred;

(19) The depth at which the fishing gear was being operated when the damage or loss occurred;

(20) The direction, speed, and activities of the claimant's fishing vessel immediately before, during, and after the damage or loss occurred (including a full description of both the deployment of any fishing gear which is the subject of the claim and all attempts at the retrieval of the gear);

(21) The amount and type of vessel traffic in the general vicinity at the time the damage or loss occurred;

(22) A full description (including any identification markings) of the item or obstruction which caused the damage or loss, if known. If the item or obstruction was physically recovered, it should be retained. If photographs of the item or obstruction are available, they shall be submitted with the claim;

(23) A description of any lighted buoy or surface marker attached to or anchored by the item or obstruction;

(24) A full statement of the claimant's reason or believing that the obstruction which caused the damage or loss is associated with oil and gas exploration, development, or production on the Federal OCS rather than with similar oil and gas activities within State waters, other ocean users, or natural causes;

(25) The names and addresses of all known witnesses to the incident which caused the damage or loss (statements from the witnesses should be submitted);

(26) If applicable, a statement concerning when and how the claimant notified NMFS within 5 days of the damage or loss as provided in § 296.7(a);

(27) The position of the commercial fishing vessel when the damage or loss occurred and the position of the obstruction causing the damage or loss (if the obstruction was dragged, give positions for both before and after it was dragged, if known), to be specified by using one or more of the following methods of position fixing. Claimants should use the most reliable method available aboard the vessel at the time of discovery of the damage or loss, such as: [1]

(i) Loran-C readings. Provide time delay readings from at least two Loran-C pairs (e.g., 7980–W and 7980–Y). Readings from additional pairs should be provided if available from the particular Loran-C receiver installed. If a coordinate converter is being used, the latitude and longitude readings may be furnished, but the actual Loran-C time delay readings are more useful because they are generally more accurate.

(ii) Distance (range) and direction (bearing) to fixed offshore objects such as lighthouses, light towers, and oil drilling or production platforms. Specify the name of each such object used (for example, Ambrose Light Tower, Shell Oil Platform No. 4281, etc.).

(iii) Distance (range) and direction (bearing) to fixed aids to navigation and landmarks which are identified on National Ocean Survey charts, such as radio towers, jetty lights, etc.

(iv) Distance (range) and direction (bearing) to prominent landmarks which are not identified on National Ocean Survey charts, but are readily identifiable for future reference.

(v) Loran-A readings. Provide time delay readings from at least two Loran-A rates. Readings from additional rates should be provided if available. Identify any skywave time delay readings as such.

(vi) Direction (bearing) to radiobeacons using a radio direction finder. Give each station's identifying call letters. Provide a copy of the radio direction finder deviation table if prepared for the fishing vessel.

(vii) Distance (range) and direction (bearing) to floating navigational aids, such as buoys. Identify any buoy by name, number, color, type and Light List number, if known.

(viii) Alternate navigation methods may be used if they are available. These include Raydist, Decca, and similar electronic navigation systems that may be in use. A celestial fix or line-of-position may be used if no other navigation method is available. In this case all calculations shall be included.

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[1] The methods are listed in descending order of accuracy. Fixes obtained by combining lines-of-position from two systems are acceptable if no single system will provide an accurate, unambiguous fix. An example is a Loran-C line-of-position and a radar range.

The use of dead reckoning, or running fixes, or both, to determine the vessel's position at the time of the damage or loss is acceptable only if no more accurate method were available. In this case, the claim shall include information sufficient to allow recalculation of the vessel position.

Bearings to shore and/or offshore objects shall be visually observed and provided in degrees. Radar bearings generally are not considered to be acceptable unless other methods are not available. If bearings are taken using a magnetic compass, they shall be converted to true by applying deviation and variation. The conversion calculation, including all figures used, must accompany the claim.

Brand name and model of all electronic and navigation equipment used in determining the geographic position of the incident should be included.

(28) A list of all crew members aboard the vessel at the time the loss or damage occurred; and

(29) Any other information which the claimant believes is relevant to the claim.

(f) *Other evidence.* The Chief, FSD, or the ALJ may require the submission of additional information, affidavits, estimates, or other evidence.

(g) *Amendment of claims.* A claimant may amend the claim at any time before the claim is referred to the ALJ.

(h) *Criminal penalty for fraudulent claim.* Any person who files a fraudulent claim is subject to criminal prosecution under 18 U.S.C. sections 287 and 1001, each of which, upon conviction, imposes a penalty of not more than a $10,000 fine and 5 years' imprisonment, or both.

§ 296.8 NMFS Processing of Claims.

(a) *Public Notice of Claims.*—(1) *Action by the Chief, FSD.* Upon receipt of a claim, the Chief, FSD, will promptly:

(i) Request an ALJ to be assigned;

(ii) Transmit an abstract of the claim to the Secretary of the Interior;

(iii) Transmit the reported location of any obstruction to the National Ocean Survey, which will inform the Defense Mapping Agency Hydrographic/Topographic Center; and

(iv) Publish notice of the claim in the Federal Register. Each Federal Register notice published under this paragraph (1) will contain:

(A) A brief statement of the nature and dollar amount of the claim, and the location where the damage or loss occurred;

(B) A statement that the Chief, FSD, may seek a proposed settlement agreement under paragraph (c) of this section; and

(C) A statement that an interested person or any other person may, within thirty (30) days following publication of the notice in the Federal Register, submit to the Chief, FSD, any evidence concerning either the claim or a proposed settlement agreement.

(2) *Action by the Secretary of the Interior.* (i) After receiving an abstract of the claim under paragraph (a)(1) of this section, the Secretary of the Interior will promptly send written notice of the claim to all persons known to have engaged in activities associated with OCS oil and gas exploration, development, or production in the vicinity where the damage or loss occurred.

(ii) Persons to be notified under paragraph (a)(2)(i) of this section shall include all persons known to have engaged in activities associated with OCS oil and gas exploration, development or production in all lease blocks either wholly or partially contained within a 3-mile radius of the reported location of the damage or loss, and such other persons as the Secretary of the Interior determines should receive notice of the damage or loss. In determining whether or not to notify such other persons, the Secretary of the Interior shall consider the nature of the damage or loss and the nature of OCS oil and gas exploration, development, or production activities (including surface supply traffic) in the vicinity of the damage or loss.

(3) *Responses to notice of claim.* (i) Any interested person may submit evidence at any hearing concerning a claim under this Part in accordance with § 296.10(d) [Reserved], or concerning any proposed settlement under paragraph (c) of this section. Any such person who intends to submit evidence at a hearing or concerning any settlement under paragraph (c) of this section must notify the Chief, FSD, in writing, describing specifically the evidence to be submitted, not later than 30 days after publication of notice of the claim in the Federal Register under paragraph (a)(1) of this section. Where evidence concerns any proposed settlement or hearing on a claim, the Chief, FSD or the ALJ, respectively, may waive the 30-day rule for good cause, such as if the interested person first requesting, after the expiration of the 30 days, to submit evidence shows that such person did not previously have knowledge that such person would have an interest in the claim and that such person has evidence which may significantly affect the outcome of the proposed settlement or any hearing on the claim, or if the evidence first became available to such person after the expiration of the 30-day period.

(ii) Each person notified by the Secretary of the Interior under paragraph (a)(2) of this section shall, within thirty (30) days after the Secretary of the Interior sends the notice, notify the Chief, FSD, and the Secretary of the Interior whether that person admits or denies responsibility for the damages claimed.

(iii) Each person who is notified by the Secretary of the Interior under paragraph (a)(2) of this section and fails to give timely and proper notice of admission or denial of responsibility under paragraph (a)(3)(ii) of this section, shall be conclusively presumed for the purposes of § 296.11 to deny responsibility for the damages claimed.

(iv) If any person admits responsibility under paragraph (a)(3)(ii) of this section or otherwise, the Chief, FSD, will so inform the claimant, and will not take any further action on the claim. If the person admitting responsibility later denies, or withdraws the admission of, responsibility, the Chief, FSD, will resume processing of the claim.

(v) Any interested person may request to be admitted as a party to any hearing concerning the claim. Such request must be filed with the Chief, FSD, in writing, not later than thirty (30) days after publication of notice of the claim in the Federal Register under paragraph (a)(1) of this section. Such request will be ruled on by the ALJ under § 296.10(c)(3)(ix) [Reserved].

(b) *NMFS review of claims*—(1) *General.* The Chief, FSD, will promptly review each claim filed under § 296.7 and determine whether it is timely filed within the 60-day period specified in § 296.7(c), properly completed under § 296.7(e), and eligible on its face.

(2) *Timeliness of claims.* (i) The 60-day filing requirement of § 296.7(c) is satisfied by the filing of an improperly completed or incomplete claim.

(ii) If the Chief, FSD, finds that the claim was not timely filed under § 296.7(c), the Chief, FSD, will refer the matter to the General Counsel.

(3) *Completeness of claims.* (i) If the Chief, FSD, finds that the claim is not properly completed or is incomplete, the Chief, FSD, will send to the claimant a written notice stating the deficiency in the claim.

(ii) If the claimant fails to correct the deficiency within 60 days after the date the notice of the deficiency is sent to the claimant, the claim is not eligible for compensation under this part unless the Chief, FSD, for good reason extends the period for correcting deficiencies.

(iii) If the Chief, FSD, finds that the claim is ineligible under paragraph (b)(3)(ii) of this section, the Chief, FSD, will refer the matter to the General Counsel.

(4) *Factual eligibility of claims.* If the Chief, FSD, finds that a claim is not eligible on its face (for example, because the claim states facts which make it ineligible under §§ 296.5(c)(1), (3), (5)(ii), (7) or (8)), the Chief, FSD, will refer the matter to the General Counsel.

(c) *Proposed settlement or other agency recommendation.* (1) After determining that the claim is timely filed, properly completed, and eligible on its face, the Chief, FSD, may contact the claimant and negotiate a proposed settlement of the claim.

(2) If the Chief, FSD, and the claimant agree to a proposed settlement, the Chief, FSD, will forward the proposed settlement to the General Counsel for action under paragraph (d) of this section.

(3) The Chief, FSD, will not forward any proposed settlement to the General Counsel sooner than thirty (30) days after publication of notice of the claim in the Federal Register under paragraph (a)(1) of this section.

(4) The Chief, FSD, may forward to the General Counsel an agency recommendation concerning the claim. The agency recommendation may be, among other things, to:

(i) Approve the claim;

(ii) Approve a proposed settlement of the claim; or

(iii) Deny the claim.

(d) *Action by General Counsel—(1) Concerning timeliness, completeness and eligibility of claims.* If the General Counsel concurs in the finding of the Chief, FSD, under paragraphs (b)(2), (3), or (4) of this section, the General Counsel will send the claim, together with a recommendation that the claim be denied, to the ALJ for an expedited hearing under § 296.10(1)(4) [Reserved].

(2) *Concerning proposed settlement or other agency recommendation.* If the General Counsel concurs in the agency recommendation of the Chief, FSD, under paragraph (c) of this section, the General Counsel will:

(i) In the case of an agency recommendation to approve either the claim or a proposed settlement of the claim,

(A) Publish a notice of the agency recommendation in the Federal Register, and

(B) Not sooner than 15 days after publication of the notice referred to in paragraph (d)(2)(i)(A) of this section, refer the claim to the ALJ under paragraph (f) of this section for consideration under § 296.10(j) [Reserved];

(ii) In the case of an agency recommendation to deny a claim, promptly refer the claim to the ALJ under paragraph (f) of this section.

(e) *Objection to certain agency recommendations.* Any interested person who objects to an agency recommendation to approve either the claim or a proposed settlement of the claim may request the ALJ to conduct an oral hearing concerning the claim. Any such request for an oral hearing must be filed in writing with the General Counsel within fifteen (15) days after the Federal Register notice is published under paragraph (d)(2) of this section and must state the interested person's reason for requesting an oral hearing.

(f) *Referral of a claim to the ALJ.* Upon expiration of the fifteen (15) day period following publication of the Federal Register notice (if any) under paragraph (d)(2) of this section, the General Counsel will refer to the ALJ the following items:

(1) The claim;

(2) Any agency recommendation under paragraph (d)(2) of this section;

(3) Any request, under paragraph (a)(3)(i) of this section, by an interested person to submit evidence at a hearing;

(4) Any request, under paragraph (a)(3)(v) of this section, by an interested person to be admitted as a party to any hearing; and

(5) Any request, under paragraph (e) of this section, by an interested person that an oral hearing be conducted.

§ 296.9 Burden of proof and presumption of causation.

(a) *Burden of proof.* The claimant has the burden to establish, by a preponderance of the evidence, all facts necessary to demonstrate eligibility for, and the amount of, compensation under this part, including, but not limited to:

(1) The identity or nature of the item which caused the damage to or loss of the fishing gear which is the subject of the claim; and

(2) That the item described in paragraph (a)(1) of this section is associated with oil and gas exploration, development, or production activities on the Outer Continental Shelf.

(b) *Presumption of Causation.* Paragraph (a) of this section notwithstanding, damages or losses are presumed to be caused by items associated with oil and gas exploration, development, or production activities on the OCS if the claimant establishes that:

(1) The claimant's commercial fishing vessel was being used for commercial fishing and was located in an area affected by OCS oil and gas exploration, development, or production activities (the damage or loss need not occur in one of the geographic areas described in § 296.3(b));

(2) A report on the location of the obstruction which caused such damage or loss, and the nature of such damage or loss, was properly made under § 296.7(a) within five days after the date when such damage or loss was discovered;

(3) There was no record on the most recent nautical charts issued by the National Ocean Survey, NOAA, or in any weekly Notice to Mariners issued by the Defense Mapping Agency Hydrographic/Topographic Center on or before the date such damage or loss was suffered, that an obstruction existed in the immedate vicinity where the damage or loss occurred; and

(4) There was no proper surface marker or lighted buoy attached, or closely anchored, to such obstruction.

(c) *Geographic exclusion from presumption of causation.* Damage or loss occurring within a one-quarter mile radius of obstructions recorded on charts or in a Notice to Mariners, or properly marked, as described in paragraphs (b)(3) and (b)(4) of this section, is presumed to involve the recorded obstruction.

§ 296.10 Hearings. [Reserved]

§ 296.11 Payment of costs.

(a) *By person denying responsibility for damage.* Any person who:

(1) Is notified by the Secretary of the Interior under § 296.8(a);

(2) Denies, or fails to either affirm or deny, responsibility for the damages claimed; and

(3) Is found by the ALJ or by a court of law to be responsible for the damage, shall pay the costs of the proceedings under this part with respect to such claim.

(b) *By the claimant.* Any claimant who files a claim under this Part and is found by the ALJ or by a court of law to be responsible for such damage, shall pay the costs of the proceedings under this part with respect to such claim.

(c) *By person denying responsibility for damage and the claimant.* If the ALJ or a court of law finds both the claimant and a person described in paragraphs (a) (1) and (2) of this section to have responsibility for such damage, then the cost of proceedings under this part shall be apportioned equitably between them.

§ 296.12 Appeals.

(a) *General.* Any person who suffers legal wrong or who is adversely affected or aggrieved by the decision of an ALJ under this part may, no later than sixty (60) days after the ALJ issues a decision under § 296.10(m) [Reserved], seek judicial review of such decision in the United States Court of Appeals for the Federal judicial circuit in which the damage occurred; or, if such damage occurred outside of any circuit, in the United States Court of Appeals for the nearest circuit.

(b) *Notice.* Any person who appeals a decision of an ALJ under this section shall so notify the claimant, the Chief, FSD, the General Counsel, and any other party in writing at the same time the appellant files an appeal with the appropriate United States Court of Appeals.

§ 296.13 Payment of award for claim.

(a) *Amount.* The Chief, FSD, will pay the amount of the award certified in the decision of the ALJ under § 296.10(m) [Reserved].

(b) *Area account.* The payment will be disbursed from the area account or

accounts specified in the decision of the ALJ under § 296.10(m) [Reserved].

(c) *Time of payment.* (1) No payment will be made under this section until the claimant has signed a subrogation agreement under § 296.14.

(2) No payment will be made under this section if an appeal has been filed under § 296.12.

§ 296.14 Subrogation.

(a) *Agreement.* Before receiving payment under this part, a claimant shall sign a subrogation agreement in a form satisfactory to the General Counsel which:

(1) Assigns to the Fund all rights the claimant has, and might have, to proceed against any person for damages with respect to any part of the damage or loss for which the award is being made; and

(2) Provides that the claimant will assist the Fund in any reasonable way to pursue collection of the subrogated rights.

(b) *Collection of subrogated rights.* In those instances in which it appears that a reasonable chance of successful collection exists, the General Counsel will refer the subrogated rights to the Department of Justice for collection.

§ 296.15 Computation of time.

Saturdays, Sundays, and Federal Government holidays shall be included in computing the time period allowed for filing any document or paper under this part (including the five-day report and claim referred to in §§ 296.7 (a) and (c), respectively), but when such time period expires on such a day, such time period shall be extended to include the next following Federal Government working day.

Appendix 1

A. *Freeport District*—The U.S. Geological Survey's Freeport District incorporates all, or the indicated portions, of the OCS areas shown on the following official maps:

1. OCS Leasing Map, South Padre Island Area, Texas Map. No. 1 (Approved July 16, 1954). That portion seaward of the 3-league line.

2. OCS Leasing Map, South Padre Island Area, East Addition, Texas Map. No. 1A (Approved May 6, 1965).

3. OCS Leasing Map, North Padre Island Area, Texas Map. No. 2 (Approved July 16, 1954). That portion seaward of the 3-league line.

4. OCS Leasing Map, North Padre Island Area, East Addition, Texas Map. No. 2A (Approved May 6, 1965).

5. OCS Leasing Map, Mustang Island Area, Texas Map No. 3 (Approved July 16, 1954; Revised October 30, 1961). That portion seaward of the 3-league line.

6. OCS Leasing Map, Mustang Island Area, East Addition, Texas Map No. 3A (Approved January 23, 1967).

7. OCS Leasing Map, Matagorda Island Area, Texas Map No. 4 (Approved July 16, 1954). That portion seaward of the 3-league line.

8. OCS Leasing Map, Brazos Area, Texas Map No. 5 (Approved July 16, 1954). That portion seaward of the 3-league line.

9. OCS Leasing Map, Brazos Area, South Addition, Texas Map No. 5B (Approved September 24, 1959).

10. OCS Leasing Map, Galveston Area, Texas Map No. 6 (Approved July 16, 1954). That portion seaward of the 3-league line.

11. OCS Leasing Map, Galveston Area, South Addition, Texas Map No. 6A (Approved September 24, 1959).

12. OCS Leasing Map, High Island Area, Texas Map No. 7 (Approved July 16, 1954; Revised August 1955). That portion seaward of the 3-league line.

13. OCS Leasing Map, High Island Area, East Addition, Texas Map No. 7A (Approved January 23, 1967). That portion seaward of the 3-league line.

14. OCS Leasing Map, High Island Area, South Addition, Texas Map No. 7B (Approved September 24, 1959).

15. OCS Leasing Map, High Island Area, East Addition, South Extension, Texas Map No. 7C (Approved September 24, 1959).

16. OCS Leasing Map, Sabine Pass Area, Texas Map No. 8 (Approved March 7, 1977). That portion on the Texas side of the Texas-Louisiana Line that is seaward of the 3-league line.

17. OCS Official Protraction Diagram, Corpus Christi NG 14–3 (Approved June 5, 1974; Revised January 27, 1976).

18. OCS Official Protraction Diagram, Port Isabel NG 14–6 (Approved June 5, 1974; Revised January 27, 1976).

19. OCS Official Protraction Diagram, East Breaks NG 15–1 (Approved June 8, 1973; Revised January 27, 1976).

20. OCS Official Protraction Diagram, Alaminos Canyon NG 15–4 (Approved June 5, 1974; Revised March 26, 1976).

21. OCS Official Protraction Diagram, Garden Banks NG 15–2 (Approved February 15, 1973; Revised December 2, 1976). That portion west of a north-south line formed by the east line of block 142 at the northeast corner and block 978 at the southeast corner.

22. OCS Official Protraction Diagram, Keathley Canyon NG 15–5 (Approved June 5, 1974; Revised December 2, 1976). That portion west of a north-south line formed by the east line of block 10 at the northeast corner and block 978 at the southeast corner.

B. *Lake Charles District*—The U.S. Geological Survey's Lake Charles District incorporates all, or the indicated portions, of the OCS areas shown on the following official maps:

1. OCS Leasing Map, West Cameron Area, Louisiana Map No. 1 (Approved June 8, 1954; Revised July 22, 1954). That portion more than three geographical miles seaward from the lines described in the supplemental decree of the United States Supreme Court, June 16, 1975 (U.S. versus Louisiana, 422 US 13).

2. OCS Leasing Map, West Cameron Area, West Addition, Louisiana Map No. 1A (Approved November 15, 1955; Revised January 30, 1957).

3. OCS Leasing Map, West Cameron Area, South Addition, Louisiana Map No. 1B (Approved September 8, 1959).

4. OCS Leasing Map, East Cameron Area, Louisiana Map No. 2 (Approved June 8, 1954; Revised August 1, 1973). That portion more than three geographical miles seaward from the lines described in the supplemental decree of the United States Supreme Court, June 16, 1975 (U.S. versus Louisiana, 422 US 13).

5. OCS Leasing Map, East Cameron Area, South Addition, Louisiana Map No. 2A (Approved September 8, 1959).

6. OCS Leasing Map, Vermilion Area, Louisiana Map No. 3 (Approved June 8, 1954; Revised June 25, 1954; Revised July 22, 1954). That portion more than three geographical miles seaward from the lines described in the supplemental decree of the United States Supreme Court, June 16, 1975 (U.S. versus Louisiana, 422 US 13).

7. OCS Leasing Map Vermilion Area, South Addition, Louisiana Map No. 3B.

8. OCS Leasing Map, Sabine Pass Area, Louisiana Map No. 12 (Approved March 7, 1977). That portion on the Louisiana side of the Texas-Louisiana line, more than three geographical miles seaward from the line described in the supplemental decree of the United States Supreme Court, June 16, 1975 (U.S. versus Louisiana, 422 US 13).

9. OCS Official Protraction Diagram, Garden Banks NG 15–2 (Approved February 15, 1973; Revised December 2, 1976). That portion bordered on the west by a north-south line formed by the west line of block 143 at the northwest corner and the west line of block 979 at the southwest corner and bordered on the east by a north-south line formed by the east line of block 80 at the northeast corner and the east line of block 1004 at the southeast corner.

10. OCS Official Protraction Diagram, Keathley Canyon NG 15–5 (Approved June 15, 1974; Revised December 2, 1976). That portion bordered on the west by a north-south line formed by the west line of block 11 at the northwest corner and the west line of block 979 at the southwest corner and bordered on the east by a north-south line formed by the east line of block 36 at the northeast corner and the east line of block 1004 at the southeast corner.

C. *LaFayette District*—The U.S. Geological Survey's Lafayette District incorporates all, or the indicated portions, of the OCS areas shown on the following official maps:

1. OCS Leasing Map, South Marsh Island Area, Louisiana Map No. 3A (Approved August 7, 1959).

2. OCS Leasing Map, South Marsh Island Area, South Addition, Louisiana Map No. 3C (Approved September 8, 1959).

3. OCS Leasing Map, South Marsh Island Area, North Addition, Louisiana Map No. 3D (Approved April 16, 1971; Revised January 18, 1972). That portion more than three geographical miles seaward from the line described in the supplemental decree of the United States Supreme Court, June 16, 1975 (U.S. versus Louisiana, 422 US 13).

4. OCS Leasing Map, Eugene Island Area, Louisiana Map No. 4 (Approved June 8, 1954; Revised July 22, 1954). That portion more than three geographical miles seaward from the

line described in the supplemental decree of the United States Supreme Court. June 16, 1975 (U.S. versus Louisiana, 422 US 13).

5. OCS Leasing Map. Eugene Island Area. South Addition. Louisiana Map No. 4A (Approved September 8, 1959).

6. OCS Official Protraction Diagram. Ewing Bank NH 15–12 (Approved February 15, 1973; Revised December 2, 1976). That portion that consists of blocks 932, 933, 937, 938, 975, 976, 977, 978, 979, 981, 982.

7. OCS Official Protraction Diagram: Green Canyon NG 15–3 (Approved February 15, 1973; Revised December 2, 1976). That portion west of a north-south line formed by the east line of block 12 at the northeast corner and the east line of block 980 at the southeast corner.

8. OCS Official Protraction Diagram. Walker Ridge NG 15–6 (Approved June 5, 1974; Revised December 2, 1976). That portion west of a north-south line formed by the east line of block 12 at the northeast corner and the east line of block 980 at the southeast corner.

9. OCS Official Protraction Diagram. Garden Banks. NG 15–2 (Approved February 15, 1976; Revised December 2, 1976). That portion east of a north-south line formed by the west line of block 81 at the northwest corner and the west line of block 1005 at the southwest corner.

10. OCS Official Protraction Diagram. Keathley Canyon NG 15–5 (Approved June 5, 1974; Revised December 2, 1976). That portion east of a north-south line formed by the west line of block 37 at the northwest corner and the west line of block 1005 at the southwest corner.

D. *Houma District*—The U.S. Geological Survey's Houma District incorporates all, or the indicated portions, of the OCS areas shown on the following official maps:

1. OCS Leasing Map. Ship Shoal Area. Louisiana Map No. 5 (Approved June 8, 1954). That portion more than three geographical miles seaward from the line described in the supplemental decree of the United States Supreme Court, June 16, 1975 (U.S. versus Louisiana, 422 US 13).

2. OCS Leasing Map. Ship Shoal Area. South Addition. Louisiana Map No. 5A (Approved September 8, 1959).

3. OCS Leasing Map. South Pelto Area. Louisiana Map No. 6 (Approved June 8, 1954; Revised July 22, 1954; Revised December 9, 1954). That portion more than three geographical miles seaward from the line described in the supplemental decree of the United States Supreme Court. June 16, 1975 (U.S. versus Louisiana, 422 US 13).

4. OCS Leasing Map. Bay Marchand Area. Louisiana Map No. 6 (Approved June 8, 1954; Revised July 22, 1954; Revised December 9, 1954). That portion more than three geographical miles seaward from the line described in the supplemental decree of the United States Supreme Court. June 16, 1975 (U.S. versus Louisiana, 422 US 13).

5. OCS Leasing Map. South Timbalier Area. Louisiana Map No. 6 (Approved June 8, 1954; Revised July 22, 1954; Revised December 9, 1954). That portion more than three geographical miles seaward from the line described in the supplemental decree of the United States Supreme Court. June 16, 1975 (U.S. versus Louisiana, 422 US 13).

6. OCS Leasing Map. South Timbalier Area. South Addition. Louisiana Map No. 6A (Approved September 8, 1959; Revised July 22, 1958).

7. OCS Leasing Map. Grand Isle Area. Louisiana Map No. 7 (Approved June 8, 1954). That portion more than three geographical miles seaward from the line described in the supplemental decree of the United States Supreme Court. June 16, 1975 (U.S. versus Louisiana, 422 US 13).

8. OCS Leasing Map. Grand Isle Area. South Addition. Louisiana Map No. 7A (Approved September 8, 1959, Revised March 7, 1961).

9. OCS Official Protraction Diagram. Ewing Bank NH 15–12 (Approved February 15, 1973; Revised December 2, 1976). That portion that does not include blocks 932, 933, 937, 938, 975, 976, 978, 979, 981, 982.

10. OCS Official Protraction Diagram. Green Canyon NG 15–3 (Approved February 15, 1973; Revised December 2, 1976). That portion east of a north-south line formed by the west line of block 13 at the northwest corner and the west line of block 981 at the southwest corner.

11. OCS Official Protraction Diagram. Walker Ridge NG 15–6 (Approved June 5, 1974; Revised December 2, 1976). That portion east of a north-south line formed by the west line of block 13 at the northwest corner and the west line of block 981 at the southwest corner.

11. OCS Official Protraction Diagram. NG 16–2 (Approved December 2, 1976).

12. OCS Official Protraction Diagram. The Elbow NG 16–3 (Approved October 10, 1972; Revised August 1, 1973; Revised December 2, 1976).

13. OCS Official Protraction Diagram. NG 16–4 (Approved December 2, 1976).

14. OCS Official Protraction Diagram. NG 16–5 (Approved December 2, 1976).

15. OCS Official Protraction Diagram. NG 16–6 (Approved June 5, 1974; Revised December 2, 1976).

16. OCS Official Protraction Diagram. St. Petersburg NG 17–1 (Approved October 10, 1972; Revised December 2, 1976).

17. OCS Official Protraction Diagram. Charlotte Harbor NG 17–4 (Approved October 10, 1972; Revised December 2, 1976).

18. OCS Official Protraction Diagram. Mobile NH 16–4 (Approved October 10, 1972; Revised December 21, 1977).

19. OCS Official Protraction Diagram. Pensacola NH 16–5 (Approved October 10, 1972; Revised December 2, 1976).

20. OCS Official Protraction Diagram. Viosca Knoll NH 16–7 (Approved October 10, 1972; Revised February 15, 1973; Revised August 1, 1973; Revised December 2, 1976).

21. OCS Official Protraction Diagram. Destin Dome NH 16–8 (Approved October 10, 1972; Revised August 1, 1973; Revised December 2, 1976).

22. OCS Official Protraction Diagram. Apalachicola NH 16–9 (Approved October 10, 1972; Revised August 1, 1973; Revised January 15, 1976).

23. OCS Official Protraction Diagram. Mississippi Canyon NH 16–10 (Approved February 15, 1973; Revised December 2, 1976).

24. OCS Official Protraction Diagram. De Soto Canyon NH 16–11 (Approved June 5, 1974; Revised December 2, 1976).

25. OCS Official Protraction Diagram. Florida Middle Ground NH 16–12 (Approved October 10, 1972; Revised August 1, 1973; Revised December 2, 1976).

26. OCS Official Protraction Diagram. Gainesville, NH 17–7 (Approved October 10, 1972; Revised December 2, 1976).

27. OCS Official Protraction Diagram. Tarpon Spring NH 17–10 (Approved October 10, 1972; Revised December 2, 1976).

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APPENDIX H

BIOLOGICAL OPINION ON ENDANGERED WHALES AS REQUIRED UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT OF 1973 AS AMENDED

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Washington, D.C. 20235

F/MM:CK

MAY 23 1980

Mr. Frank Gregg
Director, Bureau of Land Management
Department of the Interior
Washington, D.C. 20240

Dear Mr. Gregg:

This responds to your letter of January 24, 1980, in which the Bureau of Land Management (BLM) and the U.S. Geological Survey (USGS) requested initiation of formal procedures for a joint regional consultation on the Outer Continental Shelf (OCS) oil and gas program in the Gulf of Alaska area. Consultation was requested for all operations pertaining to oil and gas leasing and exploration for the total area involved in Lease Sales 46 (Kodiak), 55 (Eastern Gulf of Alaska), and 60 (Cook Inlet-Shelikof Strait).

You also requested that the Draft Environmental Statements for proposed Lease Sales 46 and 55 and the biological assessment of endangered whales in the proposed eastern Gulf of Alaska, Kodiak Island, and Cook Inlet Lease Areas serve in lieu of a formal consultation meeting. We find these documents provide sufficient information to prepare a biological opinion and that a formal consultation meeting is not necessary at this time.

Endangered Whales in the Gulf of Alaska

Seven species of endangered whales (gray, right, blue, fin, sei, sperm, and humpback) are present seasonally in the Gulf of Alaska area from late spring into early autumn (approximately May through September) as described in the biological assessment. Of these only the humpback appears to summer in significant numbers in or near the area encompassed by the three lease sales. The other species are thought to occur in the area mostly as transients during both spring and fall migrations. Except for the gray whale, which is restricted to the North Pacific Ocean, all of these endangered whales are worldwide, or nearly worldwide, in distribution. All seven species occur in the Kodiak and Eastern Gulf of Alaska proposed lease areas but only gray, fin, and humpback whales have been observed in the Cook Inlet-Shelikof area. The seasonal occurrence of endangered whales and an indication of their relative abundance in the proposed lease areas in the Gulf of Alaska region are given in Table 1. None of these whales are known to mate or calve in the area considered herein. Therefore, this facet of their biology and life history will not be adversely affected by oil and gas development in the Gulf of Alaska.

Generally it is assumed that these whales feed only within their summer range. Their principal food items and methods of feeding are given in Table 2.

Proposed Activities

A. Leasing and Pre-exploration Stages.

Activities associated with the lease sales include offering the leases, submission of bids, and awarding of leases to the successful bidders. Pre-exploration activities may involve further geophysical exploration and a small increase in vessel traffic. No adverse impact to endangered whales is anticipated from these activities, as the whales probably would actively avoid the source of any annoyance, such as high energy acoustic exploration.

B. Exploration Stage

Site specific geophysical work may be required at exploratory well locations. Lessees must submit to USGS an exploration plan and obtain USGS approval before any exploratory drilling can take place. Generally the exploration plan will identify where and how the exploratory drilling will take place. The Director of the Alaska Region, National Marine Fisheries Service will have opportunity to review exploratory drilling permit applications and make such recommendations for protection of living marine resources as he deems necessary.

Estimated Exploration Activity Based on Mean Scenario - Sale 55 (Eastern Gulf of Alaska).

Exploration is expected to begin in 1981 and continue through 1985 with a total of 14 exploration and delineation wells drilled. No more than two rigs are assumed to be working during any year. Jack-up rigs could be used in shallow water and drillships and semi-submersibles could be used in deeper water.

Primary support/supply activities would be based at the existing Yakutat facility owned by Atlantic Richfield Company (ARCO) and some marine traffic would utilize the existing facilities at Seward. These facilities would be capable of handling all necessary marine support activities during the exploratory phase. Aircraft support would be conducted at the state-owned airport at Yakutat, and Cape Yakataga would be used as an auxiliary support area during bad weather.

Estimated Exploration Activity Based on Mean Scenario - Sale 46 (Kodiak).

As this sale apparently will be postponed until 1983, we assume that the timing of exploration activities will be advanced from 1981 and 1986 to 1984

and 1989 respectively. Exploration is expected to begin in 1984 and continue through 1989 with a total of 24 exploration and delineation wells drilled. No more than one rig is assumed to be working during any year. Jack-up rigs could be used in shallow water and drillships and semi-submersibles could be used in deeper water.

Primary maritime support and supply activities would occur from existing industry facilities located at Seward and possibly from a base that would be constructed in the Chiniak Bay area. Aircraft support would be conducted from airfields located at Seward, Kodiak City, and Cape Chiniak.

Estimated Exploration Activity Based on Mean Scenario - Sale 60 (Cook Inlet-Shelikof Strait).

No more than four rigs are assumed to be working during any year. Semi-submersibles could be used, each requiring 120,000 square feet of surface area.

Primary support/supply activities would be based in the Homer area. These facilities would be capable of handling all necessary marine support activities with no further expansion during the exploratory phase. Aircraft support is unknown at this time. Two or three support and supply vessels would be needed. Future facilities may be built near Kupreanof Straits. No offshore terminals are anticipated.

Potential Impacts on Whales

Human disturbances arising from exploration activities could affect whale behavior. Development elsewhere has indicated that vessel traffic or certain engine sound frequencies may alter whale behavior. Scammon Lagoon in Mexico has been closed to all but local fishing boat traffic because of disturbance to gray whales there. Changes in the manner humpback whales occupy Glacier Bay, Alaska, have been attributed, at least in part, to increased tour ship and small boat traffic. The National Park Service has published regulations governing the number of tour ships that may enter Glacier Bay and the speeds and the distances which all vessels must observe in the presence of humpback whales. Similar guidelines have been published for the Hawaiian humpback whale grounds. There also is concern over the effects of noise and human disturbance on bowhead whales in the Beaufort Sea. Studies currently are being conducted or planned to determine the effects of sound frequencies and vessel traffic on whale behavior. The NMFS will review the results of these studies and take the appropriate action to prevent jeopardy to any of the endangered whales.

A major adverse impact to endangered whales could result from an oil spill during exploration. Potential effects of oil pollution on endangered whales may include: (1) fouling of the feeding mechanism (i.e., baleen plates), (2) ingestion of oil with unknown effect on whale physiology, (3) the reduction of

food supplies through contamination or alteration of their marine habitat, (4) irritation of skin and eyes, and (5) disruption of respiratory functions.

Major data gaps exist on the effects of oil pollution and associated OCS activities on marine mammals, especially cetaceans. For example, no comprehensive studies have been completed to determine either the effects of various sound frequencies emitted from oil and gas operations or related activities on the behavior of marine mammals, or to evaluate the impacts resulting from offshore structures and human activity on marine mammal populations, or to delineate the effect of petroleum products on marine mammals. Studies currently being conducted or funded by BLM address these problems and meaningful results should be available in two to four years. The NMFS will review these results and take the appropriate action to insure that OCS activities will not jeopardize the continued existence of any of the endangered whales.

Conclusion

Based upon our knowledge of the biology of these whales, the broad distribution of most of these endangered whales, the relatively small area involved in the lease sales, the very low probability of a major oil spill during exploration (no major spills have ever occurred from an exploratory well in U.S. waters), and the anticipated level of exploration activities (no more than four rigs working in one year in the Cook Inlet-Shelikof area; no more than two rigs working in one year in the eastern Gulf of Alaska; no more than one rig during any year in the Kodiak area; and a small increase in vessel and air traffic), NMFS concludes that the lease sale and exploration activities associated with Lease Sales 46, 55, and 60 are not likely to jeopardize the continued existence of any of the endangered whales or their habitats.

This biological opinion ends formal Section 7 Consultation for the lease sale and exploration activities associated with OCS Lease Sales 46, 55, and 60. However, consultation must be reinitiated if significant new information becomes available (habitat studies and reanalysis of available data are planned for this summer) or if the lease sale or exploration plans change significantly.

The level of development stage activity, if any, depends upon the results of exploration. Until the amount of recoverable hydrocarbon resources is estimated and the extent of production and development activities is determined, we cannot address the potential impacts on the endangered whales from such activities. Studies are now on-going or being proposed to enable us to better determine seasonal occurrence and habitat utilization patterns and the direct or indirect impacts of OCS development on endangered whales. These studies, however, are not scheduled to be completed for the next two-to-four years. We encourage studies such as those proposed in the biological

assessment. Formal consultation under Section 7 of the Endangered Species Act should take place before development and production operations proceed in the eastern Gulf of Alaska, Cook Inlet-Shelikof, or Kodiak lease areas.

Sincerely yours,

for Terry L. Leitzell
Assistant Administrator
for Fisheries

Enclosures

Table 1. Seasonal occurrence of endangered cetaceans in the Gulf of Alaska proposed lease areas.

	OCS Lease areas											
	46 - Kodiak				55 - EGOA/Yakutat				60 - Cook/Shelikof			
Species	W	Sp	Su	A	W	Sp	Su	A	W	Sp	Su	A
Gray whale	a	a	+	a	a	a	+	a		+		
Right whale	0	+	+	+	0	+	+	+	0			
Blue whale	0	+	+		0		+		0			
Fin whale	0	+	a	+	0	+	+	+	0	+	+	
Sei whale	0	+	+	+	0	+	+	+	0			
Sperm whale	0	+	+	+	0	0	+		0			
Humpback whale	0	+	a	+	0	+	a	+	0	+	+	+

Season

W - Winter, Dec. - Feb.

Sp - Spring, March - May.

Su - Summer, June - Aug.

A - Autumn (fall), Sept. - Nov.

a = abundant

0 = essentially absent

\+ = present but limited data

blank = unknown

Table 2. Principal food items and feeding method of endangered whales in the Gulf of Alaska

Species	Principal food items	Feeding method
Blue	euphausiids	engulfment
Fin	euphausiids, herring, capelin	engulfment
Humpback	euphausiids, herring, capelin	engulfment
Sei	Copepods, herring, capelin	skimming
Gray	benthic amphipods, polychaetes	Bottom feeder - engulfment
Right	Plankton	skimming
Sperm	squid, fish	unknown, may feed off bottom

APPENDIX I

BLM/OCS ENVIRONMENTAL STUDIES PUBLICATIONS

The following reports are published by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program (OCSEAP).

Name	Date	Title
Ainley, D. G. and C. R. Grau	1978	Influence of Petroleum on Eggs Formation and Embryonic Development in Seabirds. (RU 423).
Arneson, P.	1979	Identification, Documentation, and Delineation of Coastal Migratory Bird Habitat in Alaska. (RU 03).
Atlas, R.	1977	Microbial Communities in the Lower Cook Inlet, Alaska. (RU 30).
Atlas, R.	1979	Assessment of Potential Interactions of Microorganisms and Petroleum Pollutants in Alaskan Outer Continental Shelf Areas. (RU 29).
Barrick, D., A. S. Frisch, and R. Weber	1979	Lower Cook Inlet Surface Current Studies Using HFG Radar. (RU 48).
Blackburn, J. and P. Jackson	1979	Seasonal Composition and Food Web Relationships of Marine Organisms in the Nearshore Waters of Lower Cook Inlet - Including Fishes and Benthic Epifauna. (RU 514).
Bouma, A. and M. Hampton	1979	Shallow Faulting, Bottom Instability, and Movement of Sediments in Lower Cook Inlet and Wester Gulf of Alaska. (RU 327).
Burrell, D.	1978	Distribution and Dynamics of Heavy Metals in Alaskan Shelf Environments Subject to Oil Development. (RU 162).
Cacchione, D. and D. Drake	1979	Bottom and Near-Bottom Sediment Dynamics in Lower Cook Inlet. (RU 430).
Cline, J. and K. Feely	1979	Characterization and Source Identification of Anthropogenic and Natural Low Molecular Weight Petroleum Hydrocarbons in Cook Inlet and Norton Sound, Alaska. (RU 153).

RU = Research Unit

Name	Date	Title
English, T. S.	1979	Lower Cook Meroplankton. (RU 424).
Fay, F.	1977	Morbidity and Mortality of Marine Mammals. (RU 194).
Feder, H.	1979	Distribution, Abundance, Community Structure, and Trophic Relationships of the Nearshore Benthos of the Kodiak Shelf, Cook Inlet, and Northeast Gulf of Alaska. (RU 05).
Feely, R. and J. Cline	1979	Composition, Transport, and Deposition of Suspended Matter in Lower Cook Inlet and Norton Sound, Alaska. (RU 152).
Flagg, L. and R. Rosenthal	1976	An Ecological Assessment of the Littoral Zone Along the Outer Coast of the Kenai Peninsula. (RU 27).
Galt, J.	1979	Alaska Numerical Modeling. (RU 140).
Griffith, R. and R. Morita	1979	Study of Microbial Activity and Crude Oil - Microbial Interactions in Water and Sediment of Cook Inlet, Norton Sound, and the Beaufort Sea. (RU 190).
Hayes, M. and C. Ruby	1979	Coastal Morphology, Sedimentation and Oil. (RU 59).
Hoskins, C.	1978	Grain-Size Analysis and Data Reduction of Bering Sea Bottom Sediments. (RU 291).
Hoskins, C.	1978	Grain-Size Analysis of Sediment from Alaskan Continental Shelves. (RU 290).
Kaiser, R.	1977	Razor Clam Distribution and Population Dynamics. (RU 24).
Kaplan, I. R. and N. E. Reed	1978	Characterization of Organic Matter in Sediments from the Gulf of Alaska, Bering and Beaufort Seas. (RU 480).
Karinen, J., S. Rice, and S. Korn	1979	Vulnerability of Pink Salmon Eggs and Alevins Exposed to Oil in a Simulated Spawning Environment. (RU 72).
Kienle, J. and H. Pulpan	1979	Seismic and Volcanic Risk Studies - Western Gulf of Alaska. (RU 251).

Name	Date	Title
Kooyman, G. L. and W. A. Garey	1978	Effects of Oiling on Temperature Regulation in Sea Otters.
Kooyman, G. L. and W. A. Garey	1979	Effects of Oiling on Sea Otters in Nature. (RU 71).
Larrance, J. and A. Chester	1980	Composition and Source of Organic Detritus in Lower Cook Inlet. (RU 425). (Final Report)
Lees, D.	1979	Ecological Studies of Intertidal and Shallow Subtidal Habitats in Lower Cook Inlet and the NEGOA Region. (RU 417).
Lensink, C.	1979	Seasonal Distribution and Abundance of Marine Birds. (RU 337).
Lensink, C., G. Sanger, and P. Gould	1979	Population Dynamics and Trophic Relationships of Marine Birds in the Gulf of Alaska. (RU 341).
Malins, D., H. Hodgins, N. Karrack, and D. Weber	1979	Sublethal Effects on Petroleum, Including Biotransformations, as Reflected by Morphology, Chemical, Physiology, Pathology, and Behavioral Indices. (RU 73).
O'Clair, C. and S. Zimmerman	1980	Intertidal Biota and Subtidal Kelp Communities of the Kodiak Island Area. (Final Report) (RU 78).
Pitcher, K. and D. Calkins	1979	Biology of the Harbor Seal - Phoca Vitulina Richardi in the Gulf of Alaska. (RU 229).
Pitcher, K. and D. Calkins	1979	Population Assessment, Ecology, and Trophic Relationships of Stellar Sea Lions in the Gulf of Alaska. (RU 243).
Polcyn, F.	1978	Intertidal Algal Analysis. (RU 428).
Reynolds, M.	1978	Coastal Meteorology in the Gulf of Alaska. (RU 367).

Name	Date	Title
Rice, S., J. Karinen, and S. Korn	1978	Lethal and Sublethal Effects on Selected Alaskan Marine Species After Acute and Long-Term Exposure to Oil and Oil Components. (RU 72).
Robertson, D. and K. Abel	1978	Trace Metal Baseline Studies at the Aleutian, Kodiak, and St. George Basin Outer Continental Shelf (OCS) Sites. (RU 506).
Royer, T.	1979	Circulation and Water Masses in the Gulf of Alaska. (RU 289).
Schleuter, R.	1979	Oilspill Trajectory Analysis, Lower Cook Inlet, Alaska. (RU 436).
Schneider, K.	1976	Assessment of the Distribution and Abundance of Sea Otters Along the Kenai Peninsula, Kamishak Bay, and the Kodiak Archipelago. (RU 240).
Schumacher, J., S. Hayes, R. Charnell. R. Munch, and R. K. Rord	1979	Northwest Gulf of Alaska Oceanographic Processes. (RU 138).
Shaw, D. G.	1979	Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf. (RU 275).
Warner, J. S.	1978	Activity-Directed Fractionation of Petroleum Samples. (RU 500).
Whipple, J.	1977	Transport, Retention, and Effect of Toxic Petroleum Hydrocarbon in Experimental Food Chains. (RU 389).
Wise, J.	1977	Marine Climatology of the Gulf of Alaska, the Bering, and Beaufort Seas. (RU 347).

APPENDIX J

A COMPENDIUM OF THE SIZE, DISTANCE FROM SHORE, AND WATER DEPTH OF BLOCKS WHICH COMPRISE THE PROPOSED ACTION AND ALTERNATIVES TO THE PROPOSED ACTION

	Block	Hectares	Acres	Water Depth (Meters)	Distance from shore (Statute Miles)
No. 5-1	484	2304.00	5693.18	37	7
#*	527	2304.00	5693.18	35	8
	615	2304.00	5693.18	40	8
	659	2304.00	5693.18	45	8
	703	2304.00	5693.18	50	8
#*	748	2304.00	5693.18	60	11
#*	836	2304.00	5693.18	75	14
#*	880	2304.00	5693.18	40	10
#*	923	2304.00	5693.18	95	15
#*	924	2304.00	5693.18	120	17
#*	968	2304.00	5693.18	132	15
#*	1011	2304.00	5693.18	125	11
#*	1012	2304.00	5693.18	143	13
#*	1055	2304.00	5693.18	143	9
#*	1056	2304.00	5693.18	150	11
No. 5-2	93	1037.00	2562.42	15	4
	94	2304.00	5693.18	25	6
	137	2028.00	5011.18	25	5
	138	2304.00	5693.18	37	7
	181	2304.00	5693.18	28	7
	182	2304.00	5693.18	40	9
	186	2304.00	5693.18	48	11
	224	2304.00	5693.18	27	8
	225	2304.00	5693.18	27	10
	226	2304.00	5693.18	35	11
	228	2304.00	5693.18	76	15
	229	2304.00	5693.18	60	14
	230	2304.00	5693.18	40	11
	268	2304.00	5693.18	35	11
	269	2304.00	5693.18	32	14
	270	2304.00	5693.18	50	17
	271	2304.00	5693.18	76	15
	272	2304.00	5693.18	70	17
	273	2304.00	5693.18	53	15
#*	312	2304.00	5693.18	39	12
#*	313	2304.00	5693.18	39	15
#*	314	2304.00	5693.18	70	16
#*	315	2304.00	5693.18	76	18
#*	316	2304.00	5693.18	60	18
#*	317	2304.00	5693.18	46	15
#*	359	2304.00	5693.18	70	20
#*	360	2304.00	5693.18	55	18
#*	361	2304.00	5693.18	45	16
#*	404	2304.00	5693.18	54	20
#*	405	2304.00	5693.18	50	18
#*	487	2304.00	5693.18	55	15
#*	533	2304.00	5693.18	57	22
#*	580	2304.00	5693.18	70	16

Appendix J
(continued)

No. 5-2	Block	Hectares	Acres	Water Depth (Meters)	Distance from shore (Statute Miles)
#*	621	2304.00	5693.18	62	23
#*	625	2304.00	5693.18	80	12
#*	661	2304.00	5693.18	58	14
#*	662	2304.00	5693.18	73	17
#*	663	2304.00	5693.18	70	20
#*	664	2304.00	5693.18	63	23
#*	665	2304.00	5693.18	65	23
#*	666	2304.00	5693.18	65	20
#*	669	2304.00	5693.18	80	11
#*	705	2304.00	5693.18	65	14
#*	706	2304.00	5693.18	80	17
#*	707	2304.00	5693.18	80	20
#*	713	2304.00	5693.18	80	11
#*	751	2304.00	5693.18	100	21
#*	756	2304.00	5693.18	96	14
#*	757	2304.00	5693.18	95	11
#*	793	2304.00	5693.18	95	17
#*	795	2304.00	5693.18	120	22
#*	800	2304.00	5693.18	100	14
#*	837	2304.00	5693.18	120	19
#*	838	2304.00	5693.18	133	21
#*	881	2304.00	5693.18	138	19
#*	882	2304.00	5693.18	140	22
#*	925	2304.00	5693.18	143	17
No 5-3*	43	2304.00	5693.18	165	7
*	44	2304.00	5693.18	165	10
*	88	2304.00	5693.18	168	8
	131	1958.00	4838.21	174	5
*	132	2304.00	5693.18	159	7
*	176	2304.00	5693.18	155	8
&	219	2304.00	5693.18	179	6
&	220	2304.00	5693.18	146	9
&	263	2292.00	5663.53	168	8
&	264	2304.00	5693.18	146	10
&	306	2028.00	5011.18	155	8
&	307	2304.00	5693.18	159	10
&	308	2304.00	5693.18	155	13
&	350	2304.00	5693.18	161	9
&	351	2304.00	5693.18	168	12
&	352	2304.00	5693.18	161	14
&	394	2304.00	5693.18	168	11
&	395	2304.00	5693.18	165	13
&	396	2304.00	5693.18	159	16
&	438	2304.00	5693.18	168	13
&	439	2304.00	5693.18	161	14
&	479	2304.00	5693.18	134	8

Appendix J
(continued)

No. 5-3	Blocks	Hectares	Acres	Water Depth (Meters)	Distance from shore (Statute Miles)
&	480	2304.00	5693.18	165	11
&	481	2304.00	5693.18	174	13
&	482	2304.00	5693.18	168	14
&	483	2304.00	5693.18	163	12
&	522	2304.00	5693.18	146	10
&	523	2304.00	5693.18	146	12
&	524	2304.00	5693.18	179	13
&	525	2304.00	5693.18	176	15
&	526	2304.00	5693.18	174	13
&	565	2304.00	5693.18	119	12
&	566	2304.00	5693.18	137	13
&	567	2304.00	5693.18	146	14
&	568	2304.00	5693.18	183	15
&	569	2304.00	5693.18	176	13
&	570	2304.00	5693.18	176	11
&	607	2304.00	5693.18	192	7
&	608	2304.00	5693.18	174	10
&	609	2304.00	5693.18	165	13
&	610	2304.00	5693.18	174	16
&	611	2304.00	5693.18	183	16
&	612	2304.00	5693.18	179	13
&	613	2304.00	5693.18	179	11
&	651	2304.00	5693.18	192	8
&	652	2304.00	5693.18	177	11
&	653	2304.00	5693.18	177	14
&	654	2304.00	5693.18	177	16
&	655	2304.00	5693.18	177	14
&	656	2304.00	5693.18	177	12
&	695	2304.00	5693.18	192	9
&	696	2304.00	5693.18	177	12
&	697	2304.00	5693.18	177	14
&	698	2304.00	5693.18	177	14
&	699	2304.00	5693.18	177	12
&	737	0.00	0.00	---	---
&	738	2304.00	5693.18	210	9
&	739	2304.00	5693.18	192	11
&	740	2304.00	5693.18	179	13
&	741	2304.00	5693.18	177	14
&	742	2304.00	5693.18	177	12
&	781	2304.00	5693.18	219	7
&	782	2304.00	5693.18	201	10
&	783	2304.00	5693.18	192	12
&	784	2304.00	5693.18	187	15
&	785	2304.00	5693.18	179	12
&	825	2304.00	5693.18	210	8

Appendix J
(continued)

	Blocks	Hectares	Acres	Water Depth (Meters)	Distance from shore (Statute Miles)
No. 5-3					
&	826	2304.00	5693.18	199	11
&	827	2304.00	5693.18	196	14
No. 5-4					
*	48	2304.00	5693.18	170	13
*	90	2304.00	5693.18	159	14
*	91	2304.00	5693.18	174	16
*	92	2304.00	5693.18	187	13
*	133	2304.00	5693.18	150	11
*	134	2304.00	5693.18	155	14
*	135	2304.00	5693.18	168	16
*	177	2304.00	5693.18	146	12
*	178	2304.00	5693.18	155	14
	221	2304.00	5693.18	146	13
	265	2304.00	5693.18	146	14
	309	2304.00	5693.18	150	12

* Denotes blocks incorporated as Alternative IV.

\# Denotes blocks incorporated as Alternative V.

& Denotes blocks incorporated as Alternative VI.

APPENDIX K

WEIGHTS AND MEASURES

WEIGHTS AND MEASURES

All units of weights and measures are metric unless otherwise stated. The following is a conversion table from the metric system to the English system:

Metric		English
LENGTH		
1 millimeter (mm) [0.1 centimeter (cm)]	=	0.0394 inch (in.)
1 cm [10 mm]	=	0.3937 in.
1 meter (m) [100 cm]	=	39.37 in.
	=	1.09 yard (yd)
	=	3.28 feet (ft)
1 kilometer (km) [1000 m]	=	0.621 mile (mi)
1 nautical mile [1852 m]	=	6076.1 ft
	=	1 minute of latitude (approx.)
AREA		
1 square centimeter (cm^2)	=	0.155 square inch ($in.^2$)
1 square meter (m^2)	=	10.76 square feet (ft^2)
	=	1.196 square yards (yd^2)
1 hectare (ha)	=	2.4710 acres (a)
1 square kilometer (km^2)	=	0.386 square mile (mi^2)
VOLUME		
1 cubic centimeter (cm^3)	=	0.0610 cubic inch ($in.^3$)
1 cubic meter (m^3)	=	35.314 cubic feet (ft^3)
	=	1.31 cubic yards (yd^3)
1 liter	=	1.06 quarts (qt)
	=	0.264 gallon (gal)
159.18 liters	=	1 barrel of oil (42 gal)

MASS

1 kilogram (kg) [1000 grams (g)]	=	2.20 pounds (lb)
	=	0.0011 ton
1 metric ton (MT) [1000 kg]	=	1.10 ton
	=	0.9842 long ton (LT)
136.2 kilograms	=	1 barrel of oil (300 lbs)

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